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Construction Methods and Equipment

McGraw-Hill Publishing Company, Inc.

March, 1939

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LOW-COST HOUSES BUILT OF PLYWOOD PANELS

In the leading article this month J. STANLEY YOUNG, project architect for the Fort Wayne (Ind.) Housing Authority, tells how that organization built 50 houses, at cost of $1,600 each, to rent for $2.50 weekly.

Plywood panels were fabricated in special plant near site, delivered by truck and erected quickly by unskilled labor.

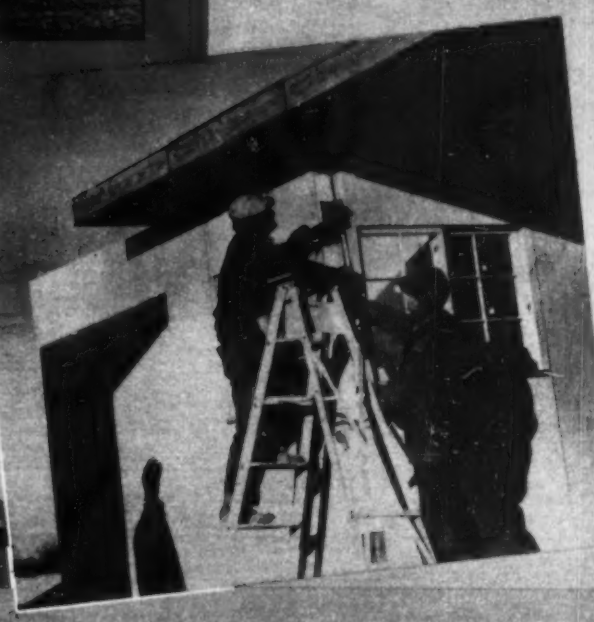
Other Articles in This Issue:

WAREHOUSE WITH WELDED "UMBRELLA STAY" ROOF

EMPLOYEE RELATIONS AT FORT PECK DAM

SAFETY IN TUNNEL CONSTRUCTION

HIGHWAY MAINTENANCE METHODS IN VIRGINIA



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TECHNOLOGY DEPT.

CURRENT JOBS

. . . . and Who's Doing Them

BRIDGES

Substructure for Potomac River bridge, at Ludlow Ferry, Md., went to **Merritt, Chapman & Scott Corp.**, of New York City, for $2,089,324. Low bid of $960,000 for substructure for Susquehanna River bridge at Havre de Grace, Md., was submitted by **R. C. Reitz**, of Lancaster, Pa. Grade crossing elimination structure at Absecon, N. J., was awarded to **A. Miller**, of Atlantic City, for $643,731. **Nicholas DiMenna & Sons, Inc.**, obtained $330,601 contract for grade separations in Queens County, New York. Low bidder for substructure of Cherry St. bridge, Milwaukee, Wis., was **Great Lakes Dredge & Dock Co.**, of Milwaukee, with price of $397,500; low bid for superstructure, $151,345, was submitted by **Milwaukee Bridge Co.** Bridge at De Funiak, Fla., will be built for $427,141, by **G. D. Auchter Construction Co.**, of Jacksonville.

BUILDINGS

Public—A federal office building costing $1,792,165 will be built in New Orleans, La., by **S. N. Nielson Co.**, of Chicago. For the Army Air Corp at Hickam Field, Hawaii, **R. E. McKee** has done work on a barracks to cost $1,158,720. General contract for a state hospital group at Southbury, Conn., was awarded to **W. E. Stevens Co.**, of Springfield, Mass., for $1,189,000; on the same project a $1,249,000 contract for cottages and maintenance building went to The **E. & F. Construction Co.**, of Bridgeport, Conn. In Jamaica, N. Y., work is starting on a $1,618,000 tuberculosis hospital under contract with **John Kennedy & Co.**, of New York City. Barracks at Fort Jay, N. Y., will be built by **T. J. Waters & Son**, of New York City, for $856,400. An $851,999 contract for hospital ward building in Washington, D. C. was bid in by **Bahen & Wright, Inc.**, of Washington. The Central Nebraska Public Power & Irrigation Dist. has engaged **W. J. Assenmacher & Co.**, of Lincoln, Neb., to build a $727,357 power plant. At Rockford, Ill., high school to cost $700,000 is under construction by **C. B. Johnson**, of Chicago. **Walbridge & Aldinger**, of Detroit, are contractors for a college dormitory at Ann Arbor, Mich., to cost $711,425. A contract for an industrial warehouse for the Navy at Mare Island, Calif., to cost $673,500, is **MacDonald & Kahn Co.**, of San Francisco. Sixteen apartment units of a housing project in Augusta, Ga., will be built for $519,498, by **C. W. Angle**, of Greensboro, N. C.

Commercial—For a housing project comprising 27 buildings in Normandy, Mo., suburb of St. Louis, successful contractor was **H. B. Deal & Co.**, of St. Louis, with price of $3,250,000. A contractor for a $3,000,000 apartment development in New Rochelle, N. Y., is **William Berbeusse, Jr.**, of New York City. A $2,000,000 housing project in Riverdale Park, New York City, has been started by **Clement S. Crystal, Inc.**, of New York. The owner, **F. A. Brotsch, Jr.**, is building a $1,600,000 multiple dwelling project in Rochester, N. Y. In Chicago, **B. C. Brautigam**, of that city is engaged on a $1,500,000 apartment building group. An office building in Des Moines, Ia., to cost $1,500,000, was awarded to **A. H. Neumann & Bros.**, local contractors. Replacement of hospital buildings damaged by fire in Philadelphia, Pa., is under way, at cost of $1,250,000, by **United Engineers and Constructors**, of that city. In Brookline, Mass., a $1,000,000 contract for group of brick apartment houses went to **Walter Reed Corp.**, of Boston.

HIGHWAYS

Among recent contract awards for highways are the following: Mississippi: $213,737, to **West Construction Co.**, of Chattanooga, Tenn.; $246,074, to **Weymouth Construction Co.**, of Milwaukee, Wis.; $226,829, to **J. Oman, Jr.**, of Nashville, Tenn.; $225,364 to **E. W. Grannis**, Fayetteville, N. C. New York: $202,395, to **Lane Construction Corp.**, of Meriden, Conn.; $367,549, to **Bero Engineering & Contracting Corp.**, of North Tonawanda; $364,948, to **R. Myers**, of Salem, Ind. North Carolina: $322,794, to **Albert Bros., Inc.**, of Salem, Va. Texas: $201,185, to **Austin Road Co.**, of Dallas. Connecticut: $192,730, to **D. Arrigoni**, of Middletown, Conn. Alabama: $175,399, to **Hardaway Contracting Co.**, of Columbus, Ga.; $184,184, to **W. C. Howton Contracting Co.**, of Birmingham. Pennsylvania: $212,116, to **Holmes Construction Co.**, of Wooster, Ohio.

WATERWORKS AND SEWERS

The city of Bethlehem, Pa., has awarded a $1,019,126 contract for 32 mi. water main to **Lock Joint Pipe Co.**, of Ampere, N. J. Low bidder for tunnel contract on Delaware River water supply for New York City, was **Samuel Rosoff, Ltd.**, of New York, with price of $18,916,650. **The Central Contracting Co.**, of Dallas, Tex., is installing a $233,350 water supply system at Fort Benning, Ga. Water works construction in Portland, Me., costing $134,141, is under way by **Camillo Profenno Co.**, local contractor. In Detroit, Mich., a $174,729 water works contract went to **R. D. Baker**, local contractor. With bid of $1,384,569, **Tully & Di Napoli**, of Long Island City, obtained contract for sewage treatment works at Bowery Bay, New York City. Force main and pumping station contract amounting to $224,462, at Saugus, Mass., went to **John MacDonald Construction Co.**, of Newton, Mass. North Providence, R. I. awarded a $274,580 trunk sewer contract to **Marocco Construction Co., Inc.**, of Baltimore, Md. For a sewage treatment in Pontiac, Mich., low bid of $243,884, was submitted by **H. C. Love Co.**, of Anderson, Ind.

Construction Methods and Equipment

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MARCH, 1939

Robert K. Tomlin, Editor
A. E. Paxton, Manager

Editorial Staff: Vincent B. Smith, Paul Wooton (Washington), Nelle Fitzgerald

A McGraw-Hill Publication

The "How" of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How HANGING ROOF was suspended by welded rods radiating from center post. — p. 33
How MAGNESITE STUCCO was applied to theme structures of New York World's Fair. — p. 34
How UNSKILLED LABOR erected low-cost houses of prefabricated plywood panels. — p. 36
How FABRICATING SHOP was equipped to produce plywood box-beam panels for houses. — p. 38
How STEEL RODS tied wall and roof panels in low-cost plywood houses. — p. 40
How SYSTEMATIC EMPLOYMENT METHODS aided U. S. Engineers in procuring qualified workers for Ft. Peck dam. — p. 42
How CLAY KNIVES started tunnel excavation for Chicago subway. — p. 45
How THIN CONCRETE SHELL for municipal bandstand was constructed with wood forms. — p. 46
How STEEL GRID REINFORCEMENT for bridge roadway was anchored by welding. — p. 47
How TUNNEL SAFETY MEASURES reduced accident frequency and severity. — p. 48
How DILUTED VINEGAR SOLUTION neutralized alkali in cement burns. — p. 49
How HARD HATS and safety-toe boots prevented skull fractures and broken feet. — p. 49
How AGGREGATE PLANT was converted to batching plant for loading truck mixers. — p. 54
How TRUCK-MOUNTED CRANE handled ram for driving highway guard rail posts. — p. 55
How LARGE MAINTENANCE GANGS, reorganized from patrol units, improved secondary roads. — p. 56
How TRACTORS AND TRUCKS used by maintenance crews facilitated work on secondary roads. — p. 57
How STEEL-WHEEL CARRIAGES moved 75-ton bridge. — p. 58
How 56 INTERIOR COLUMNS supported 5-acre roof of windowless factory. — p. 59
How ALL-WELDED SHEET-STEEL HOUSES were built, insulated and finished in factory. — p. 60
How FRAMING MEMBERS of all-steel houses were formed by press brake bender. — p. 61
How HOLLOW STEEL WALLS were sealed against moisture penetration. — p. 61

DAMS AND WATERWAYS

At Cortez, Colo., **Gerard Knutson Construction Co.**, of Kansas City, Mo., will build $238,629 Groundhog dam. Riprap construction at Kingsley dam in Nebraska, to cost, $1,011,015, will be placed by **A. H. Reed & Co.**, of Cheyenne, Wyo. Bulkhead wall sewer fill along East River Drive, New York City, went to **A. M. Hazell, Inc.**, of New York, for $783,585. For the U. S. Engineer Department at Huntington, W. Va., flood wall costing $509,826, was awarded to **R. Meyers**, of Salem, Ind.

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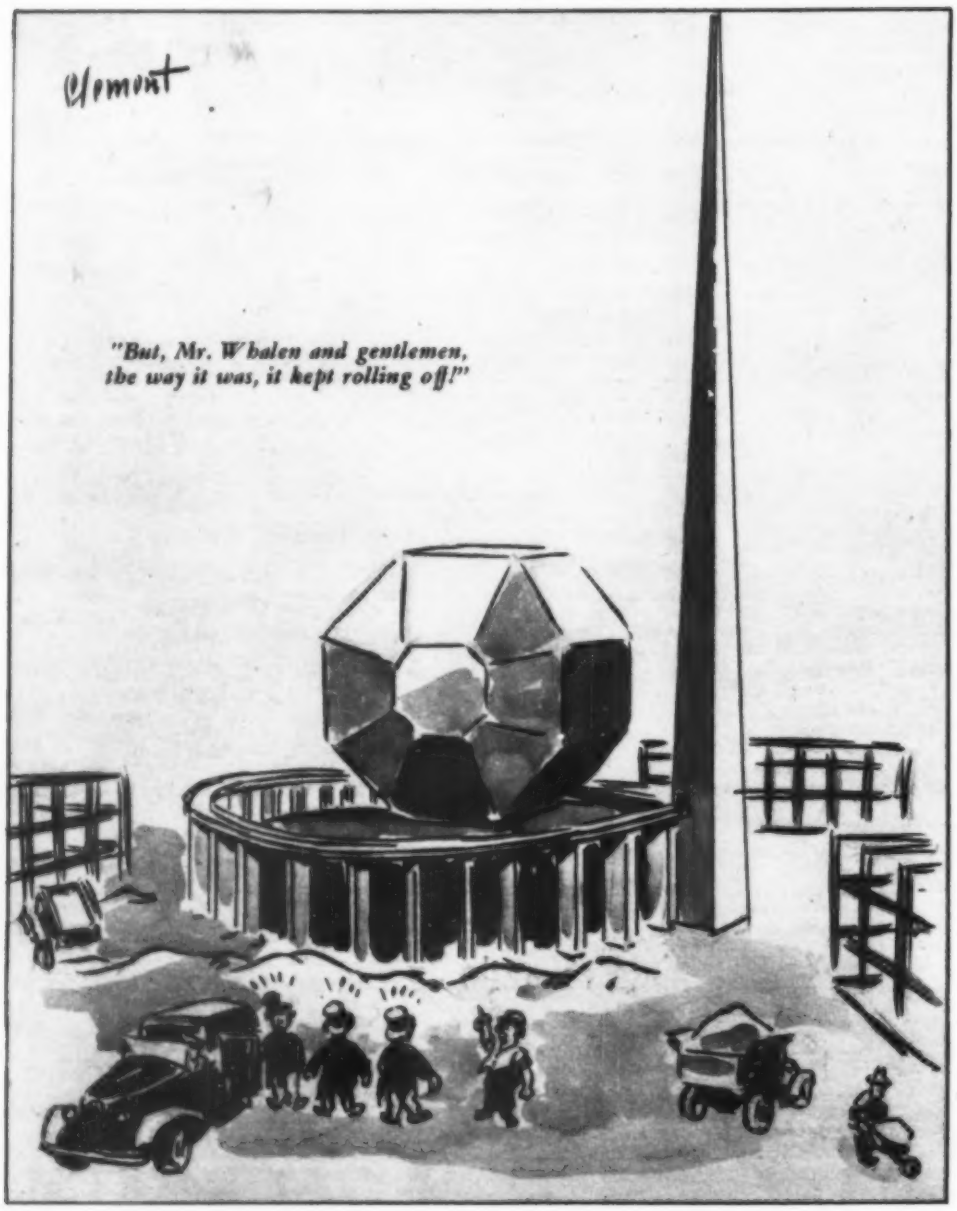
"He always does better work with an audience!"

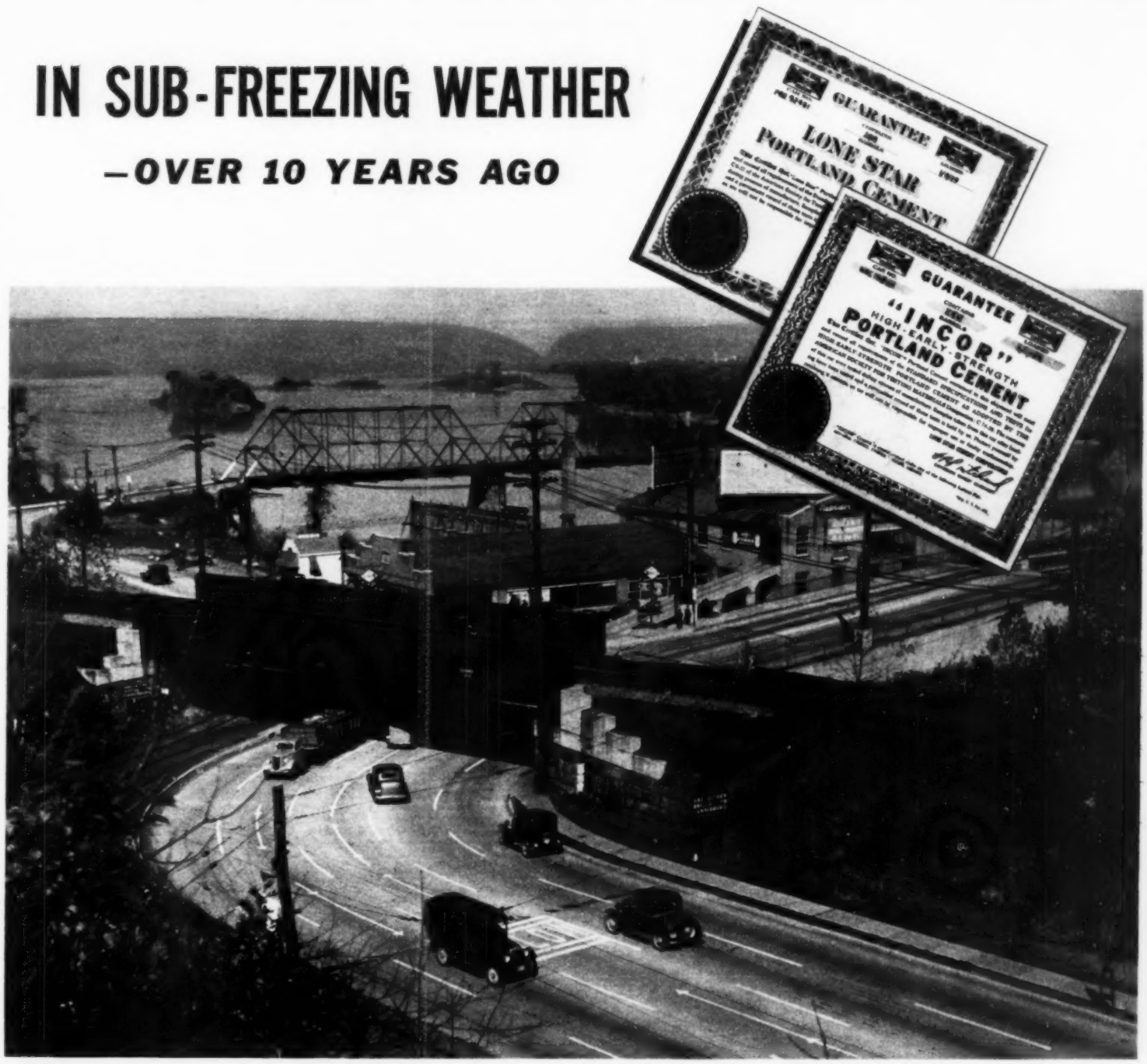


"But, Mr. Whalen and gentlemen, the way it was, it kept rolling off!"

"Fore!"

IN SUB-FREEZING WEATHER

—OVER 10 YEARS AGO



IN sub-freezing weather, winter of 1928-29, Pennsylvania State Highway Department widened and resurfaced "Bottleneck" Highway, on west bank of the Susquehanna River near Harrisburg. Detour was impracticable, as photo (above) suggests.

'Incor' concrete covered with burlap and straw, was opened in 24 hours, as required to maintain traffic. *After 10 years' hard service—17,000 cars a day—'Incor' concrete is as good as the day it was opened.*

Dependable high-early strength, plus long-time, expense-free service—typical of 'Incor's 12-year record. Performance is 'Incor's best recommendation. Use 'Incor'* wherever 24-hour service strengths and fast, thorough curing save you money. Elsewhere, use Lone Star—Portland-cement quality standard for over a quarter century. To get concrete at lowest cost, figure every job with both cements.

Written guarantee (shown above) with every shipment of Lone Star and 'Incor', assures quality equal to or exceeding standard specifications. Better cement makes better concrete.

Write for copy of new illustrated book, "Cutting Concrete Costs." Lone Star Cement Corporation, Room 2263, 342 Madison Ave., New York.

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LONG boom, large-capacity bucket and modern high-speed operation are combined in the Bucyrus-Monighan Walker to give big output on a wide operating range. Easy, accurate control enables the operator to hold grades accurately on both bank and spoil pile. Because the Walker operates on its circular, big-area base, it can work close to the edge of the bank, on any ground that will support a man. Rain or shine, this big-output dragline walks and works, delivering a fast, steady digging performance that means profits for you.

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BIG *output!*

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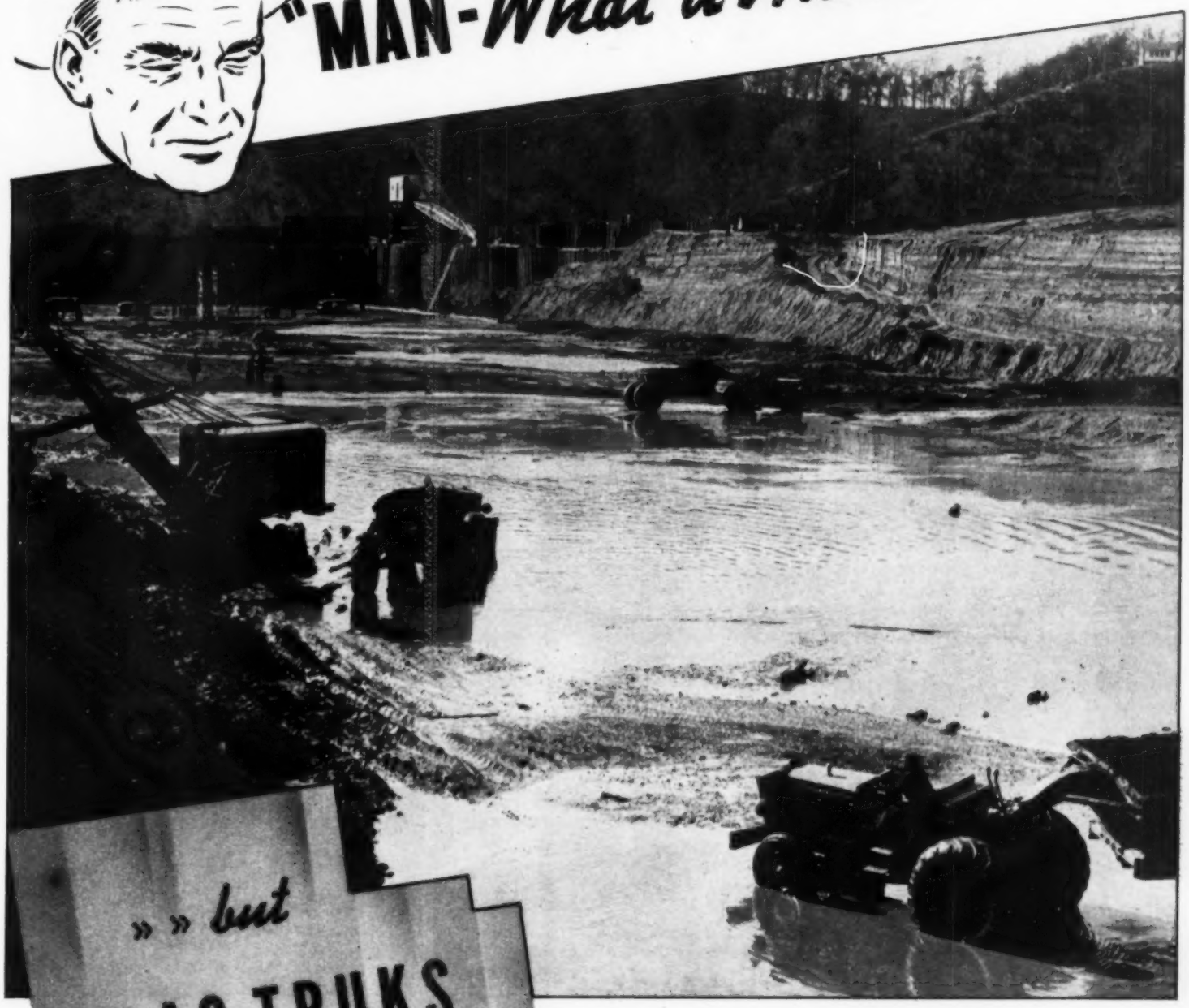
"MAN-What a Water Hole!"



» » but TRAC-TRUKS walked through it on scheduled time » » »

HERE'S another project where Euclid Trac-Truks earn a profit for the contractor despite adverse working conditions. At the Pensacola Dam, Vinita, Oklahoma, Sammons-Robertson maintain a fast working schedule moving 4,000,000 yards from September 1st to January 1st. Trac-Truks are the best insurance for profits on the toughest jobs. They have the carrying capacity, the ready maneuverability, power and traction that it takes for this kind of work. You'll go farther, faster with Trac-Truks on your next big job. Talk it over with your Trac-Truk representative . . . discover, "first-hand," how to cut a big slice off your hauling costs!

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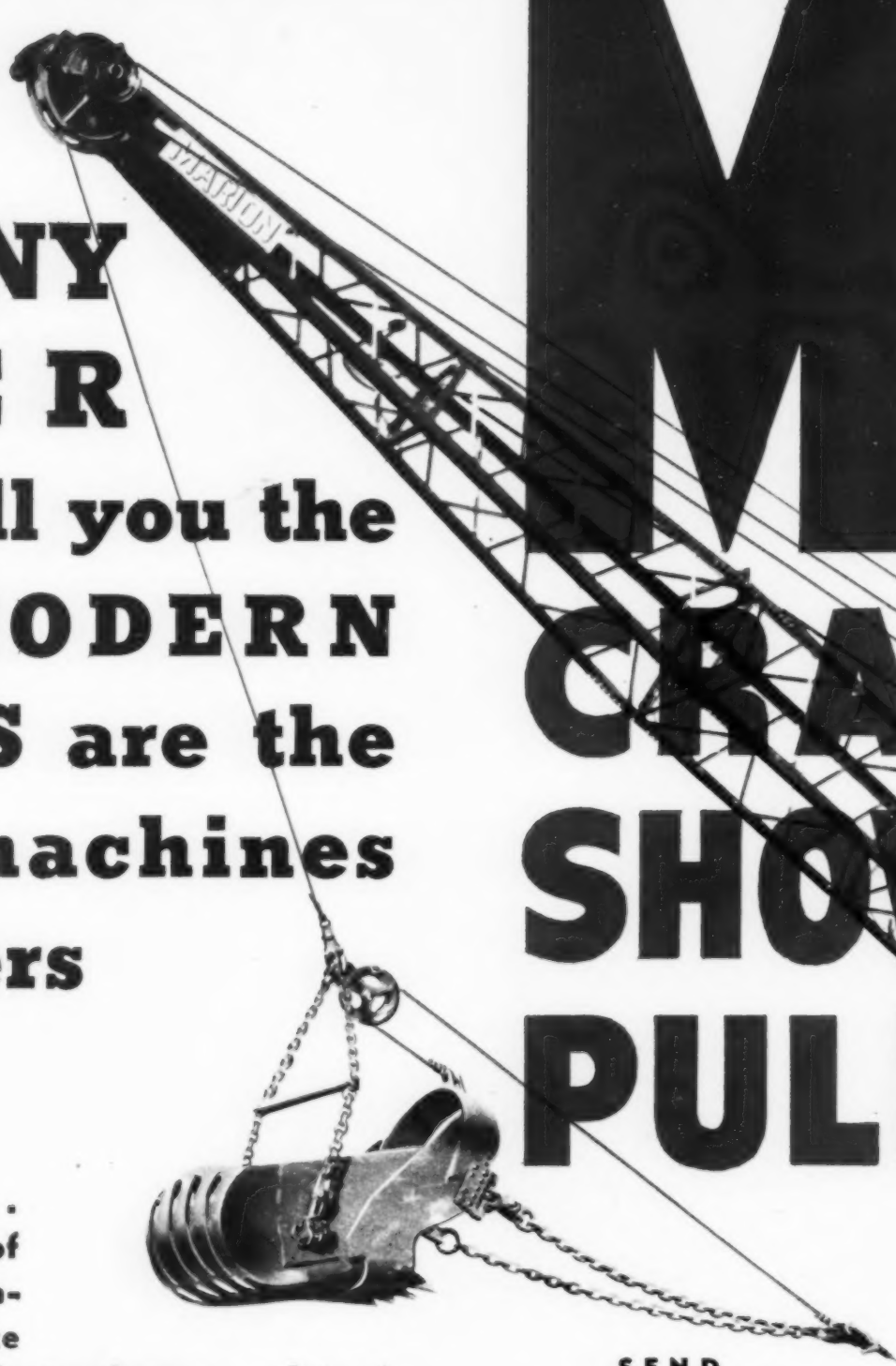
He will tell you the NEW · MODERN MARIONS are the fastest machines on crawlers

FAST



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When you buy a Marion . . . you buy a proven machine of modern design . . . sturdy construction . . . proper balance . . . maximum stability . . . plenty of power . . . lots of speed . . . an excavator that is built with modern day digging and material handling requirements in mind. Make your next machine a MARION . . . and you will make yourself some real money. ●

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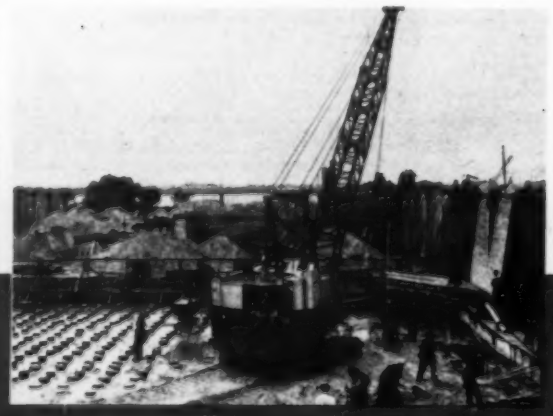
THOMAS A. ROGAN, Yonkers, N. Y. A Modern Marion Type 36S—Diesel—1½ cubic yard Shovel used on general construction work. » » »



ALUMINUM COMPANY of AMERICA, Pittsburgh, Pa.—A Modern Marion Diesel Crane is being used by this company at its Mobile, Alabama plant.

TANGREEN & HESS, Inc., Bronx, [illegible] Marion Type 36S—working in rock an excavating job and giving an e[illegible] tant account of itself. » »

ARION

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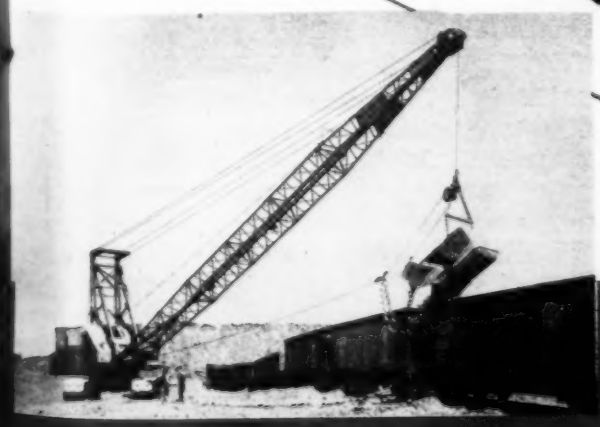
LS • CLAMSHELLS
HOVELS

MODERNIZE with MARIONS FROM 3/4 CU. YARDS UP

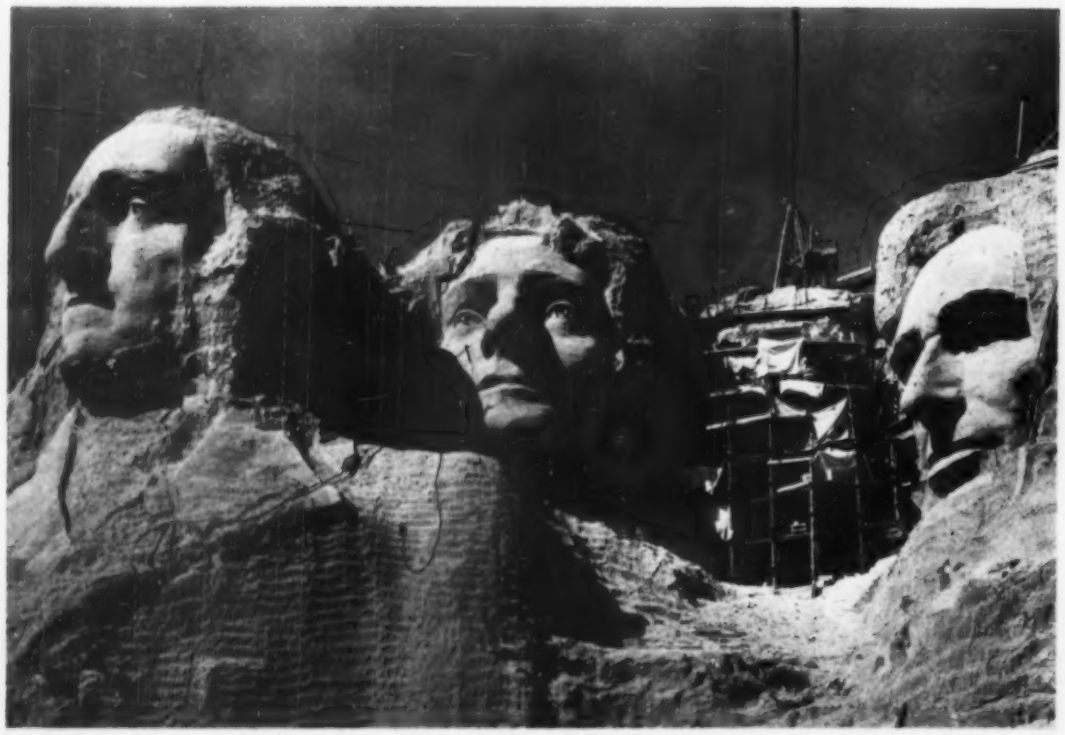
STURDY



UTAH CONSTRUCTION COMPANY
Ogden, Utah.—A Modern Marion Type 40-A dragline loading slag near Salt

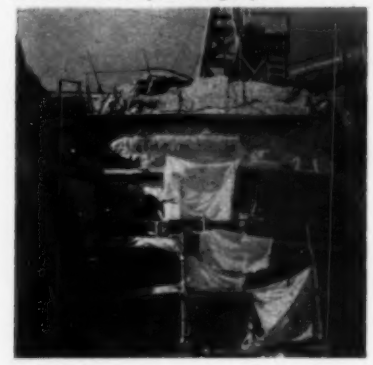
MEN MOLD MOUNTAINS

Sculptor Borglum's heroic figures look out across the Black Hills from 6000-ft. elevation



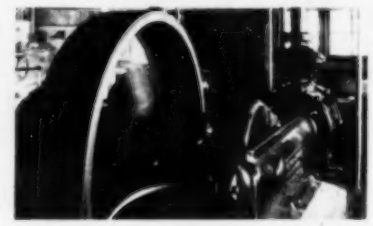
Close-up of the Mt. Rushmore Memorial Group at present. Note the enormous amount of granite that has been drilled and chipped so far. Note the workmen in various areas of the photo.

Gutzon Borglum's famous Mount Rushmore National Memorial, nearing completion in the Black Hills of South Dakota, from a distance of 1500 ft. Washington, Jefferson, Lincoln, and Theodore Roosevelt will comprise the group.



Out of this mass of granite, 6000 feet above sea-level, will emerge the likeness of Theodore Roosevelt. Thousands of cubic yards of solid granite will have to be drilled and removed.

A close-up of the partially finished likeness of Lincoln. Note ladders and cat-walks for comparative size. These figures are the largest ever to be hewn out of granite anywhere in the world.



All compressors and air tools in use on this gigantic undertaking are Texaco lubricated 100%.

CHANGING THE CONTOUR of mountains into heroic likenesses of men requires power from machines.

Texaco is proud of its association with this monumental undertaking, designed to commemorate the memory of these American immortals . . . The equipment used is Texaco lubricated 100%. The Texas Company, 135 East 42nd Street, New York City.

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THE NEW AND VERY SPECIAL

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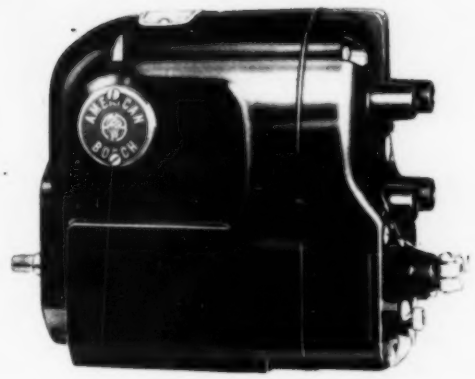

OVER 50 foremost manufacturers of automotive, stationary and marine engines and machinery point with pride to the use of American Bosch Magnetos on their equipment. They know it has remained for years the mark of leadership in magneto ignition.

Now—with the American Bosch Super Powered Magneto—it means more than ever before. This newest magneto has an amazing magnet metal that has 6 times more magnetic power. As employed by American Bosch it revolutionizes magneto design ... creates new standards of dependability ... often cuts magneto maintenance costs in half. New booklet tells the story—write for it.

AMERICAN BOSCH CORPORATION, Springfield, Mass.

AMERICAN BOSCH *Super Powered* MAGNETO

FORESIGHT in the face of a late start opened the span *on time*—reduced curing costs $1,950

The contract called for "opening the span to traffic" not later than December 1. Late in October reinforcing steel for the bridge deck was only partially in place. Only 5 weeks remained for placing and curing 3,753 square yards of concrete pavement. Impending cold weather was an added obstacle. But the contractor's foresight in planning to use Lehigh Early Strength Cement for completion won the race against time. Instead of the usual 14 to 21 days' wait for form removal, quick service concrete permitted removal in 5 to 6 days. Heat protection was correspondingly reduced. The contractor estimated that compared with the use of normal cement curing costs were lower by $1,950—overhead costs on the entire job were 5% less. Whenever time saving is imperative or will be economical, use Lehigh Early Strength Cement. It produces service strength for most uses in 24 to 48 hours. It is a safeguard against the changeable weather of early spring for it quickly cures beyond the danger of freezing. The Lehigh Service Department will gladly answer your questions.

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Allentown, Pa. **Chicago, Ill.** **Spokane, Wash.**

Center Ave. Bridge between Moorhead, Minn., and Fargo, N. D. Contractor: Wm. O'Neil Sons Co., Faribault, Minn. Bridge Engineer: Minnesota State Highway Dept., M. J. Hoffman. Project Engineer: W. C. Nitardy.

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"Easy to run and does more work" Says operator Emery Potter—

● "I have operated most of the leading makes of Shovels and Cranes in the last 15 years, and can truthfully say, in reply to your inquiry, that I prefer the Link-Belt Speed-o-Matic K-45, that I have been running for the Parlor City Construction Company.

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"There is a lot to being comfortably seated, and having short, easy-throw levers under your fingers; instead of being obliged to reach for long levers and wearing yourself out in doing it all day long.

"The Speed-o-Matic is so easy to run and makes it possible to do so much more work, that I don't know what more an operator or owner could ask for."

Emery Potter

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2 The toe comes first. No explosive energy wastes into the air. A beautifully controlled shot!

3 An instant later—everything under control.

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CHEMICALS ATLAS EXPLOSIVES

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with the NEW LORAIN-79

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Here's the strongest boom ever placed on a Lorain machine—a 23' all-welded boom of entirely new construction. Its Center Drive design makes for greater ranges, too, as proved by the fact that the Lorain-79 can dig practically 29' high with boom at 50°.

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And we do mean "double." Improved Center Drive design uses double pinion to send a greater flow of power into the hoist shaft equipped with bigger drums and more cable capacity. Add to this, simplicity of construction and direct application of power and there's your answer to a turntable design that can really give and take.

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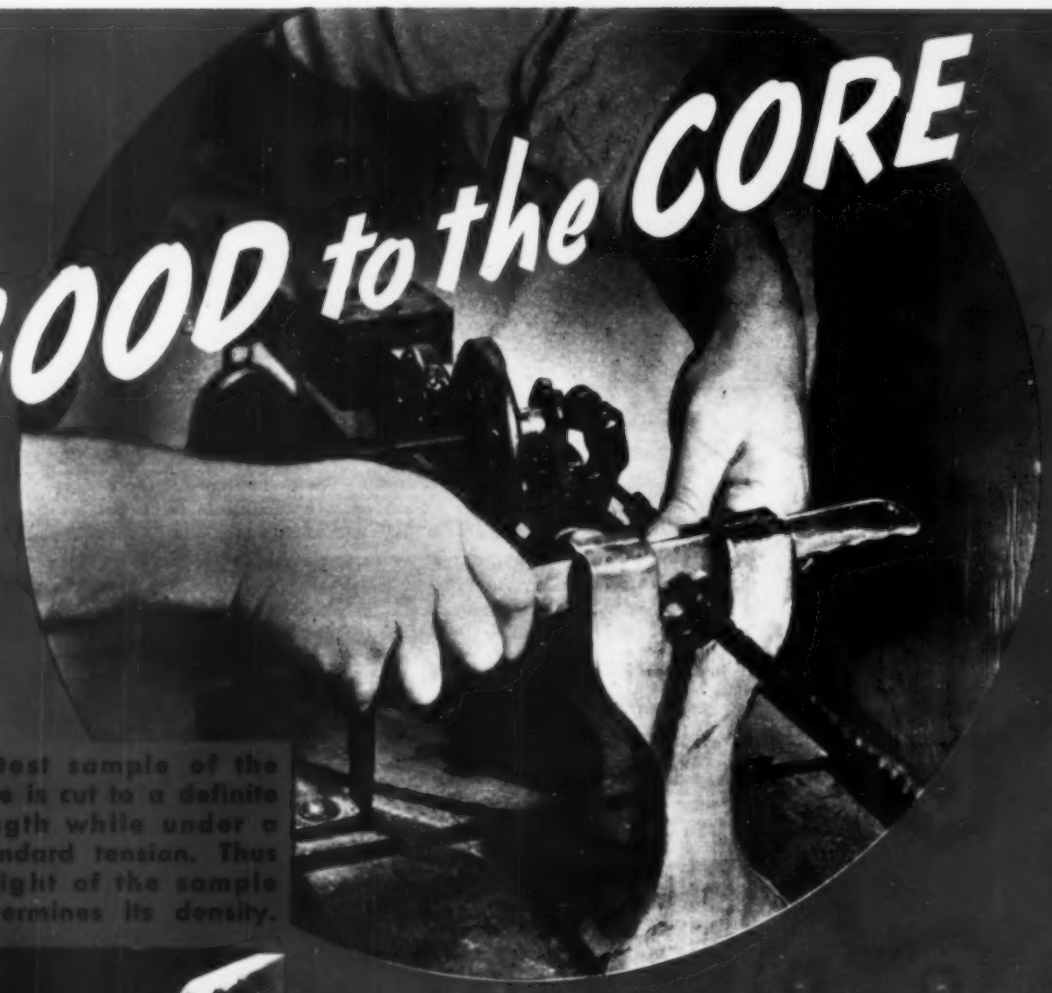
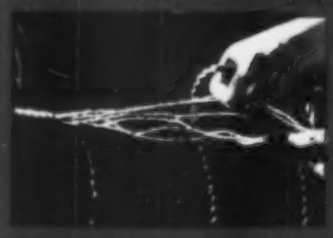
LORAIN, OHIO

GOOD to the CORE



A test sample of the core is cut to a definite length while under a standard tension. Thus weight of the sample determines its density.



The core is unraveled to see that construction specifications are followed.

The diameter is measured as a check of core uniformity.

BUILDING LIFE INTO WICKWIRE ROPE *BEYOND SPECIFICATIONS*

Wickwire Spencer engineers are ever alert to the fact that no wire rope is better than its foundation. When the core is hemp, every physical characteristic of the hemp—*and of the oil used to impregnate it*—is scrupulously checked. The result is a core which keeps the strands "working together" yet safely separated. This means a better balanced, longer-lasting rope, which in turn means fewer rope dollars spent—but more profit dollars for you.

It is still the privilege of the progressive manufacturer to build rope life into his product beyond official specifications.

WICKWIRE ROPE

WICKWIRE SPENCER STEEL COMPANY

General Offices: 41 East 42nd Street, New York City; Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles, Tulsa, Chattanooga, Houston, Abilene, Texas, Portland, Seattle. Export Sales Department: New York City

KOEHRING

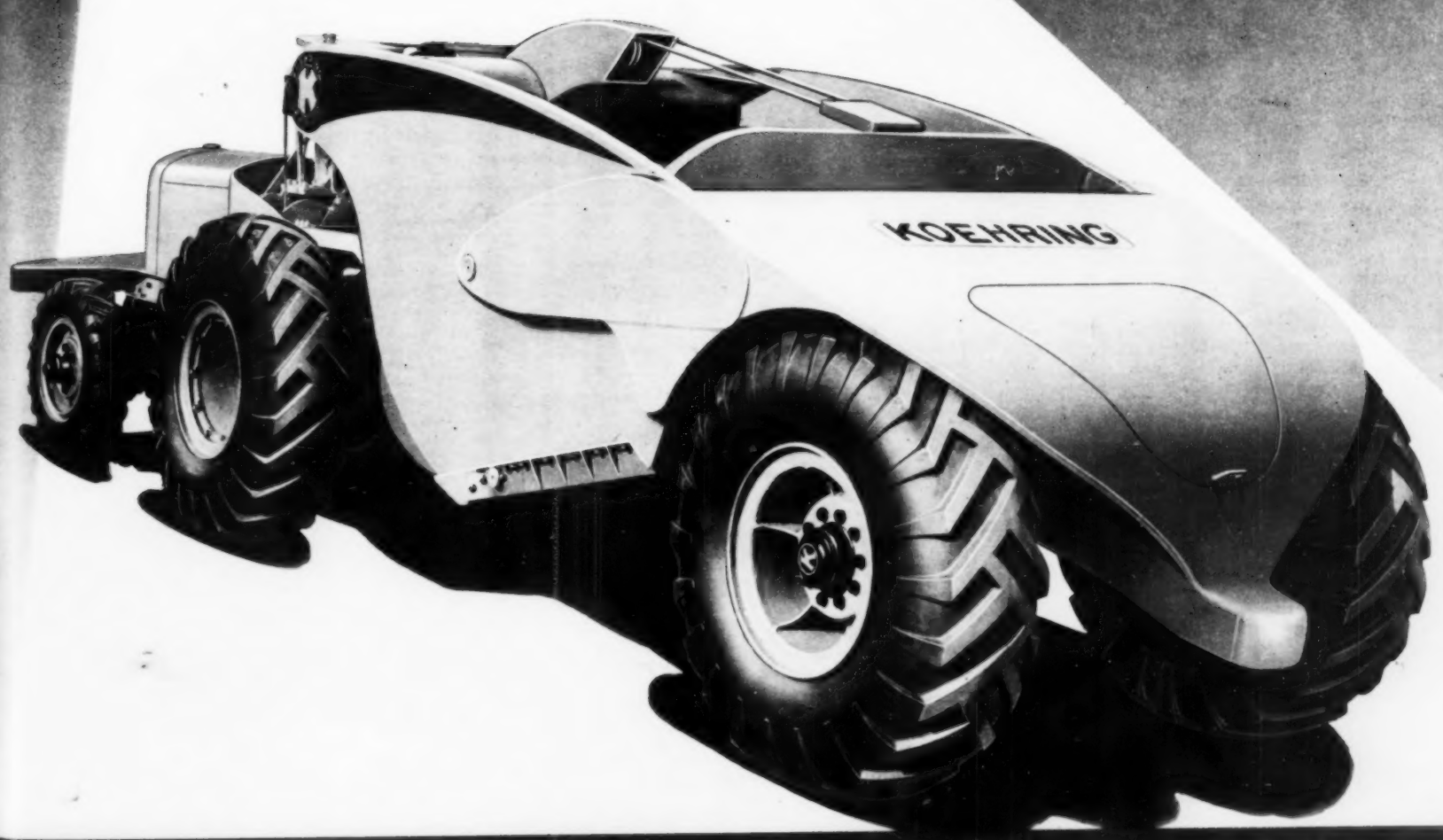
Wheeler method

Moves Dirt • Faster • Cheaper

KOEHRING HEAVY DUTY

Loads of power to load — exceptionally high speed for travelling — Push tractor applies power where needed, ***behind*** the cutting blade. High speed, time-tested job-proven Koehring Tractor hauls the Wheeler to and from the dump. Write for information about costs and production of ***This Newest Method — The Koehring Wheeler Method***

KOEHRING COMPANY
MILWAUKEE • WISCONSIN



HEAVY-DUTY CONSTRUCTION EQUIPMENT

Caterpillar Diesel

REG. U. S. PAT. OFF.

THE POWER USED BY LEADING EQUIPMENT AND MACHINERY MANUFACTURERS

MORE THAN 100 of America's most prominent builders of contracting and industrial equipment power their products with "Caterpillar" Diesel Engines. And the number is constantly growing!

The wider their field, the more extensive their use, the more dominant their lead, the more assuredly it will pay you to *standardize* — to insist on these soundly engineered and precision-built power units in the equipment you buy. . . . Because —

"Caterpillar" Diesel Engines **in all your equipment enable you to simplify engine servicing and maintenance: No variety of fuels nor big assortment of lubricating oils to carry; no contacting different parts-and-service facilities!**

"Caterpillar" Diesel Engines **need less time-out for maintenance; require very little operating attention and comparatively few adjustments.**

"Caterpillar" Diesel Engines **respond quickly to variable loads. No delay or wasted pick-up time!**

"Caterpillar" Diesel Engines **have long operating life. Operating records of 18,000 to 20,000 hours and over, at amazingly low maintenance expense, are not uncommon.**

"Caterpillar" Diesel Engines **are the last word in operating economy. Compared with gasoline, they use, approximately, only half the quantity of fuel at about half the price per gallon.**

"Caterpillar" Diesel Engines **operate dependably from short periods of light load to long periods of continuous heavy duty; in torrid heat or frigid cold.**

"Caterpillar" Diesel Engines **are backed by the most complete and readily available parts-and-service facilities of any engines in the world.**

NINE ENGINE SIZES • 32 TO 160 HORSEPOWER

CATERPILLAR TRACTOR CO., PEORIA, ILL.

1

ROLLER — Street job in Spokane, Washington. The 15-ton Buffalo-Springfield road roller, equipped with a 44-horsepower "Caterpillar" Diesel Engine, works 8 hours a day on 1 gal. of 9c fuel per hour.

2

COMPRESSOR—A Sullivan portable air compressor, powered with a 125-horsepower "Caterpillar" Diesel Engine, working near Redding, Calif., on part of $175,000,000 Central Valley Water project. Owner, Colonial Construction Co. ("Caterpillar" Diesel-powered shovels and compressors were first on the job at Shasta Dam, and were used to start the 1800-ft. tunnel serving as temporary route for the S.P.R.R. during dam's construction.)

3

CRUSHER—A 125-horsepower "Caterpillar" Diesel Engine driving No. 8 Telsmith and 3-ft. Telsmith cone crusher, with conveyors, etc. Outfit turns out 60 yds. per hour on 4 1/6 gals. of 7c fuel. After 8000 hours, engine showed but little sign of "age." Location, near Yakima, Wash. Owner, H. C. Rogers.

4

CRANE — A "Caterpillar" Diesel Engine, of 125 horsepower, in Link-Belt crane lowering steel form in place for pouring 19½-ft. diameter concrete culvert to "house" Toby Creek, near Wilkes-Barre, Pa. Engine uses only 2½ gals. of low-cost fuel per hour. Owner, Wagner & Son. (75% of the equipment on this entire job is "Caterpillar" Diesel-powered.)

WHEN YOU FIGURE YOUR LUBRICATION COSTS...

bring COMPARATIVE MAINTENANCE COSTS *into the picture*

then learn the real value of

GULF'S *higher quality* LUBRICANTS!

TRY this measuring stick on your lubrication costs: compare your maintenance costs from month to month and determine whether they are going up or down. If maintenance is high, ineffective lubrication may be the reason . . . and no matter how little you're paying for lubricants, your *real* lubrication costs may be too high!

After making a careful study of comparative maintenance costs, an official of a large operating company recently said: "Of course we are paying a few dollars more each month for Gulf's higher quality lubricants, but look at this reduction in maintenance costs! Our actual dollar savings amount to nearly ten times the total cost of the lubricants. At that rate we're getting our oils and greases for less than nothing . . . *and that's the lowest lubrication cost I ever heard of!*"

You may find it difficult to evaluate all the intangible factors that make up your final lubrication costs. But of this you may be sure: when you put Gulf's higher quality lubricants to work you have taken a forward step toward improving the operation of your equipment, reducing waste, cutting maintenance expense and making over-all savings which will give you the lowest possible "lubrication costs."

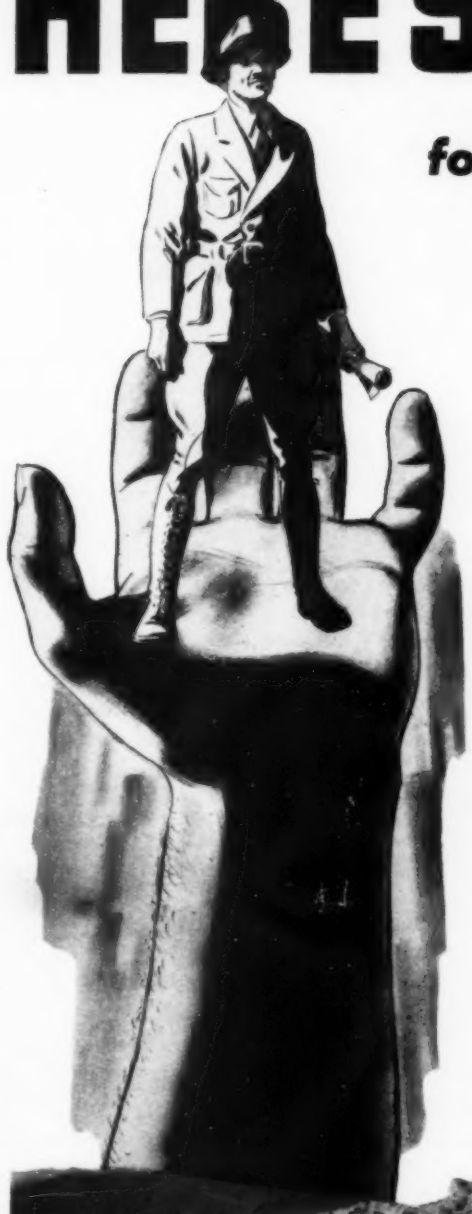
Ask the Gulf representative who calls on you to discuss this matter in detail. He can help you get a true picture of your actual lubrication costs. Gulf Oil Corporation—Gulf Refining Company, Gulf Building, Pittsburgh, Pa.

GULF INDUSTRIAL LUBRICATION

Also MAKERS OF A COMPLETE LINE OF FUEL AND FURNACE OILS

HERE'S A BIG BOOST

for YOUR Production Capacity . . Your Profits with Today's Athey Forged-Trak Trailers and the D-8 "Caterpillar" Tractors!



ARE YOU up-to-date on the big improvements in hauling equipment that give you greater hauling capacity . . . at far lower cost? Those improvements are yours today—with Athey Forged-Trak Trailers and "Caterpillar" D-8 Tractors! You'll get greater hauling speed because these Athey and "Caterpillar" units can operate steadily and consistently regardless of weather or ground conditions. You'll haul bigger loads every trip—yet your fuel costs will go down. Get the NEWS about what Athey Forged-Trak Trailers and "Caterpillar" Diesel Tractors can do to boost your profits. The coupon will bring you full information.

ATHEY TRUSS WHEEL CO.
5631 West 65th St. CHICAGO, ILLINOIS
Cable Address: "Trusswheel", Chicago

43% Faster . . . *Owing to constant improvement, today's Athey 18-yard Bottom Dump Wagons, pulled by Caterpillar Diesel Tractors, travel 43% faster than those of yesterday!*

125% more capacity

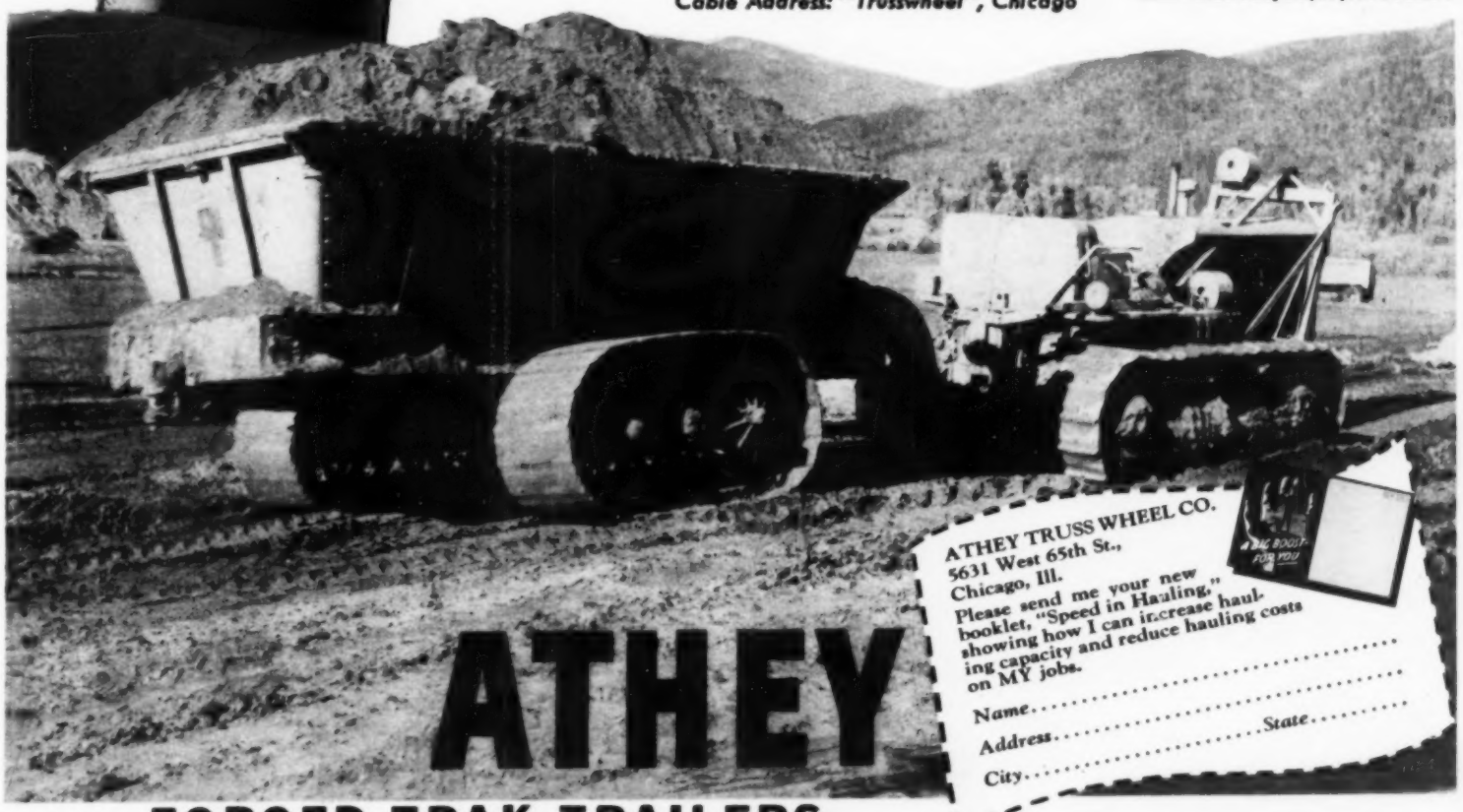
Today's D-8 Tractor now hauls today's Athey Forged-Trak 18-yard Bottom Dump Trailer or two Trailers in train—total capacity 36 yards loose measurement—a 125% increase.

69% lower Fuel Cost

Today's D-8 Tractor uses an average of 4 gallons of Diesel fuel at 7c per gallon—only 28c per hour fuel cost on the average job!

36% lower drawbar pull . . . *Today's Athey Forged-Trak Trailers require only 70 lbs. of drawbar pull per ton of gross load—as compared with yesterday's 110-lb. drawbar pull. What's more, Athey Forged-Trak Wheels now provide 100% longer track life!*

It will pay you to get full information—mail coupon for free booklet.



ATHEY

FORGED-TRAK TRAILERS

ATHEY TRUSS WHEEL CO.
5631 West 65th St.,
Chicago, Ill.
Please send me your new booklet, "Speed in Hauling," showing how I can increase hauling capacity and reduce hauling costs on MY jobs.

Name.....
Address.....
City.....State.....

Presenting

The Improved LAPLANT-CHOATE Rear Dumping "CARRIMOR" Scrapers

• They Reduce Your Costs
• Bring New Economy to Jobs
Other Type Scrapers Cannot do Efficiently.

they DIG

The narrow cutting width and easy loading design of the Improved "Carrimor" Scrapers enables them to *dig* and *load* material which must be ripped for other scrapers. Working them alongside other types of scrapers reduces ripping necessary to permit other scrapers to load.

Thus, by reducing . . . and in many instances completely eliminating one operation, you save time and handle more material at lower cost. This means extra profits for you.

they HAUL

The "Carrimor" assures capacity loads secured in *less* loading time and distance. These time-saving, money-saving *full* loads are hauled with greater speed over rougher places without danger of tipping.

LaPlant-Choate "Carrimor" Scrapers have a scientifically designed bell shaped bowl which reduces loading resistance to a minimum. This gives you faster loading with less power which helps cut your operating expense. Although these scrapers carry their load with high clearance, they are accurately balanced to assure outstanding stability. The "Carrimor" goes through where four-wheel scrapers would tip over.

they DUMP

Here is a highly efficient scraper that dumps well out back of the wheels. With famous LaPlant-Choate finger-tip hydraulic control, your operator can back the "Carrimor" up and dump material over end fills, around bridges, etc., with ease, accuracy and safety. Other scrapers that cannot do this can be kept economically busy on straight production work.

Positive hydraulic control assures effortless, accurate control over the scraper at all times. Operators quickly get the "feel" of every load and have added confidence in their equipment. This means higher efficiency.

they SPREAD

The improved "Carrimor" not only dumps very sticky material with time-saving efficiency but it also spreads the material evenly. Simply throw the dump lever in going forward and out comes the load . . . and it is spread in a layer without having to pull over the dumped load.

As many have already learned, these improved, simple, lower cost scrapers have a place on *all* scraper jobs. They do their work at lower cost, yet increase the output of other type scrapers by doing jobs the others won't do efficiently. Get full details today from your "Caterpillar" and LaPlant-Choate dealer or write to the manufacturer.

Available in 3 sizes for use with "Caterpillar" Track-type Tractors

LaPLANT-CHOATE MANUFACTURING CO. Inc.
CEDAR RAPIDS, IOWA

Martin Wunderlich

DOUBLED THE PAYLOAD EACH TRIP

Show a contractor the ways and means to do a *better* job . . . at a substantial profit over present savings . . . and his progressive instincts won't be denied. It's evident among earthmovers like Martin Wunderlich Company, getting their 100% and more extra yardage each load by using two tractors' horsepower to load LeTourneau extra-capacity Carryall* Scrapers—the industry's latest bid for lower dirt costs.

As for light Carryall draft, Wunderlich put their three huge Model "RU" Carryalls (rated at 30 yards, heaped measure) to the severest test right from the start—excavating wet river sand for a temporary channel change on Nebraska's Keystone Dam . . . the world's second largest earth-fill dam. Tough going for any hauling unit, you'll agree. Yet, despite extremely wet conditions, eight large diameter, broad-tread pneumatic tires "buoy" each Carryall up for quicker pusher loading. Loads (weighed on the job) run as high as 61,000 pounds and are obtained in but little over the loading time required for much smaller scrapers. From there, one D8 tractor provides all necessary traveling power and handles *complete* ejection of every wet, sticky load. With every adverse force combined against successful operation — each Carryall chalks up 2650-foot cycles of load, haul, dump and return every 20 minutes!

Don't forget—LeTourneau gives you unbeatable performance in every Carryall Scraper from 3 to 30-yard size. Ask your "Caterpillar" and LeTourneau dealer to interpret the Carryall differences in terms of savings to you—with a demonstration. All you have to do is ask; he'll do the rest. Better make it *today!* R. G. LeTOURNEAU, INC., Peoria, Illinois, Stockton, California, Cable address: "Bobletorno".

It's no wonder only LeTourneau Carryall Scrapers are capable of such amazing performance. LeTourneau pioneered the pusher-scraper trend with the three Carryall "plus" features necessary to successful operation under any conditions: (1) *Natural digging suction* of the cutting edge to apply full tractor power to *pay* loading, combined with (2) *light draft*, produced by lighter, stronger alloy steels "floated" on plenty of large diameter tires, cut power demand . . . and, most important: (3) *positive cable control* wipes all loads from the bowl by the Carryall's forceful load ejector tailgate — independent of the whims of gravity dump or "gadget" controls.

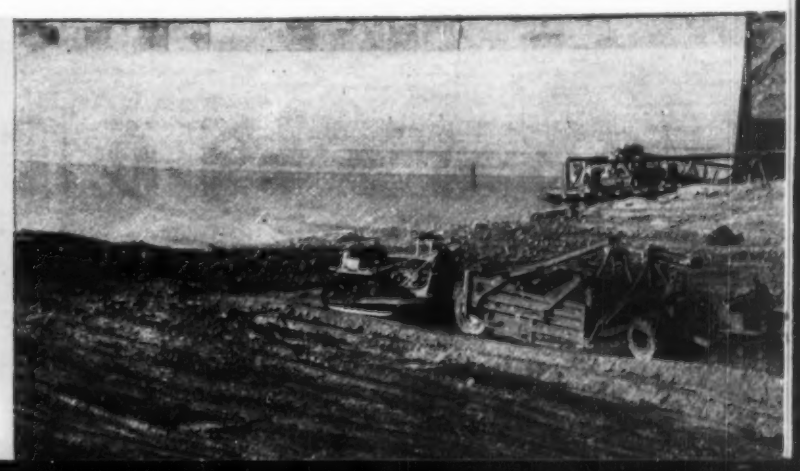
for Lowest net cost per yard

LETOURNEAU

CARRYALL* SCRAPERS

ANGLEDOZERS* BULLDOZERS, ROOTERS*, POWER CONTROL UNITS, BUGGIES* DRAG SCRAPERS, PUSHDOZERS, SHEEP'S FOOT ROLLERS, CRANES, TREEDOZERS.

*Name Reg. U. S. Pat. Off.



"Give me a shovel that's fast on the job—fast to get there —fast to finish! Then, bring on the competitive bids!"

P&H really started something with these new Pacemakers, built entirely of rolled alloy steels. This design cuts off dead weight, makes a machine that is stronger, lighter — and enough faster to make a big difference in yardage costs.

P&H owners can give you some interesting facts about cost cutting on all sorts of jobs. Harnischfeger Corporation, 4494 W. National Avenue, Milwaukee, Wisconsin.

P&H PACEMAKERS — *Save money on the job*

17 DIFFERENT MODELS

P&H

From ⅜ to 5 cu. yds. capacity. Gas, Diesel or electric power. Write for literature on the size and type that interests you.

HARNISCHFEGER
CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

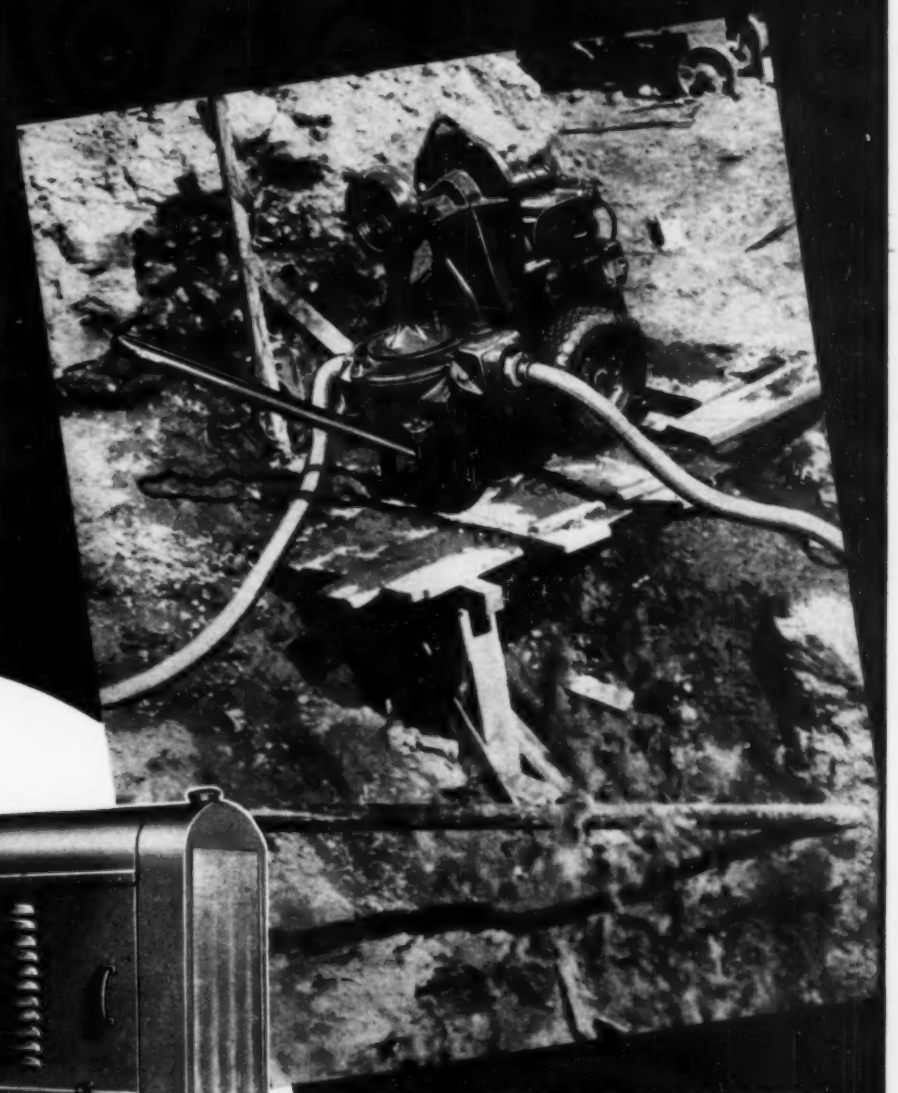
GET INTO THE PROFIT CLASS

WITH

NOVO PUMPS

Whether it's on the *Highways of Tomorrow* or the *Construction of Today*, the new features incorporated in the Novo Pumps mean profits to you. They just can't miss and you can prove it to yourself.

Road Pumps—Diaphragm Pumps —Self-Priming Centrifugal Pumps— all meeting the A. G. C. Standards on every size.



NOVO ROAD PUMP

The greatest Road Pump Novo ever built. A powerful pump that has been designed to take the most gruelling service.

ECONOMICAL OPERATION is assured by the Novo Water Governor which has been proven to be an economy on operating costs and a saver of pump and pipe lines.

A. G. C. Standard Ratings are easily met by this pump and the lower price will surprise you.

THE NEW DIAPHRAGM PUMP

Did you ever see anything neater than that new Novo Lift and Force Diaphragm Pump above? That isn't half of the news about this easy-to-handle, big-capacity, utility pump.

You know the old, never-fail operation of the diaphragm pump on tough pumping jobs—thick muddy water, heavily laden with sand, gravel, and debris—large quantities of air with intermittent pumping. The new Novo Diaphragm eats these jobs up—besides, it has the enclosed gearing and close-coupled modern design.

Get the dope below.

NOVO ENGINE CO.

214 Porter St. Lansing, Mich.

Send this Coupon

NOVO ENGINE CO., 214 Porter St., Lansing, Mich.

Please send full information on the

New Novo Road Pump .....

New Novo Diaphragm Pump .....

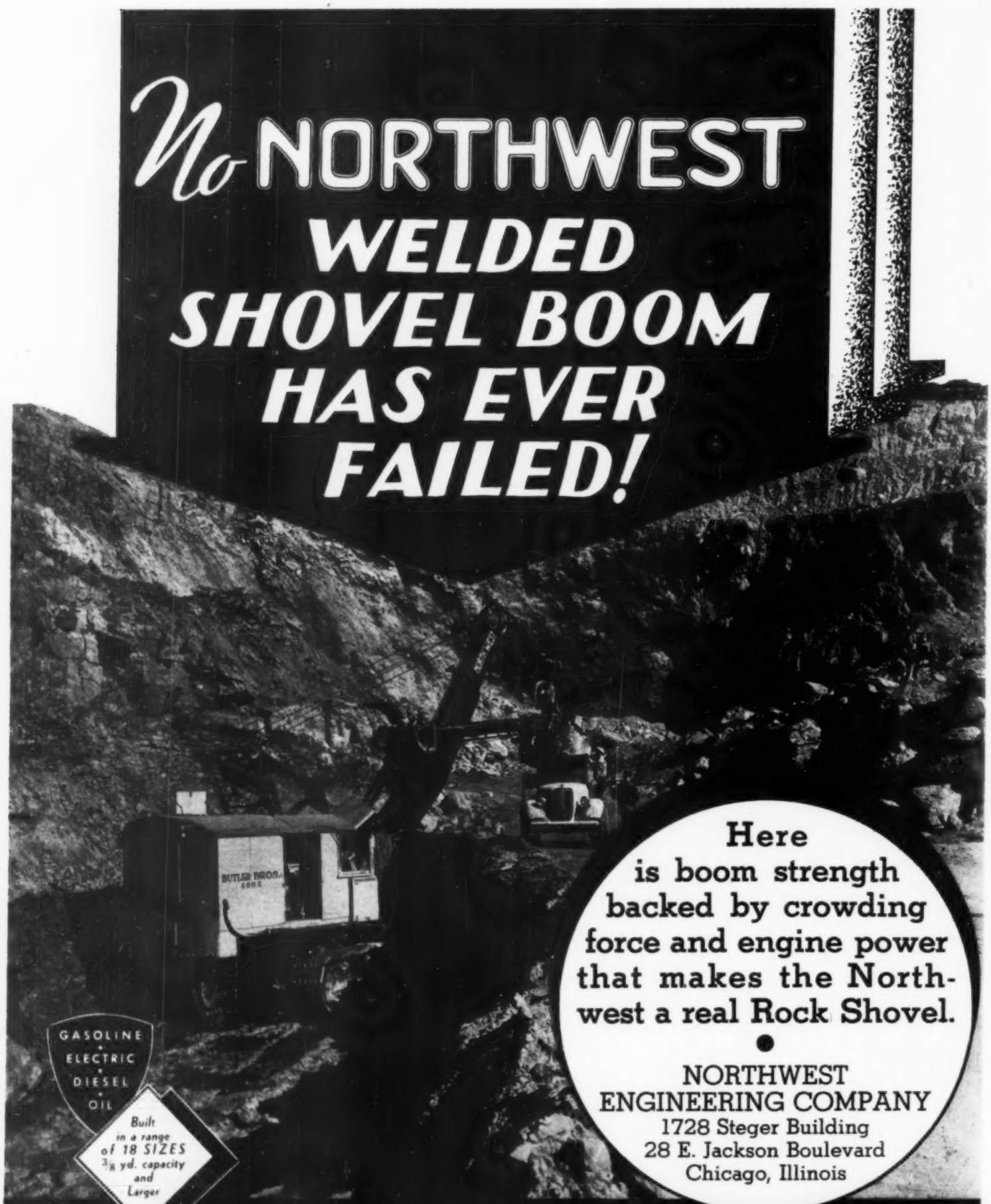
New Novo Self-Primers .....

Name .....

Address .....

City ..... State .....

No NORTHWEST WELDED SHOVEL BOOM HAS EVER FAILED!



GASOLINE
ELECTRIC
DIESEL
OIL

Built in a range of 18 SIZES 3/8 yd. capacity and Larger

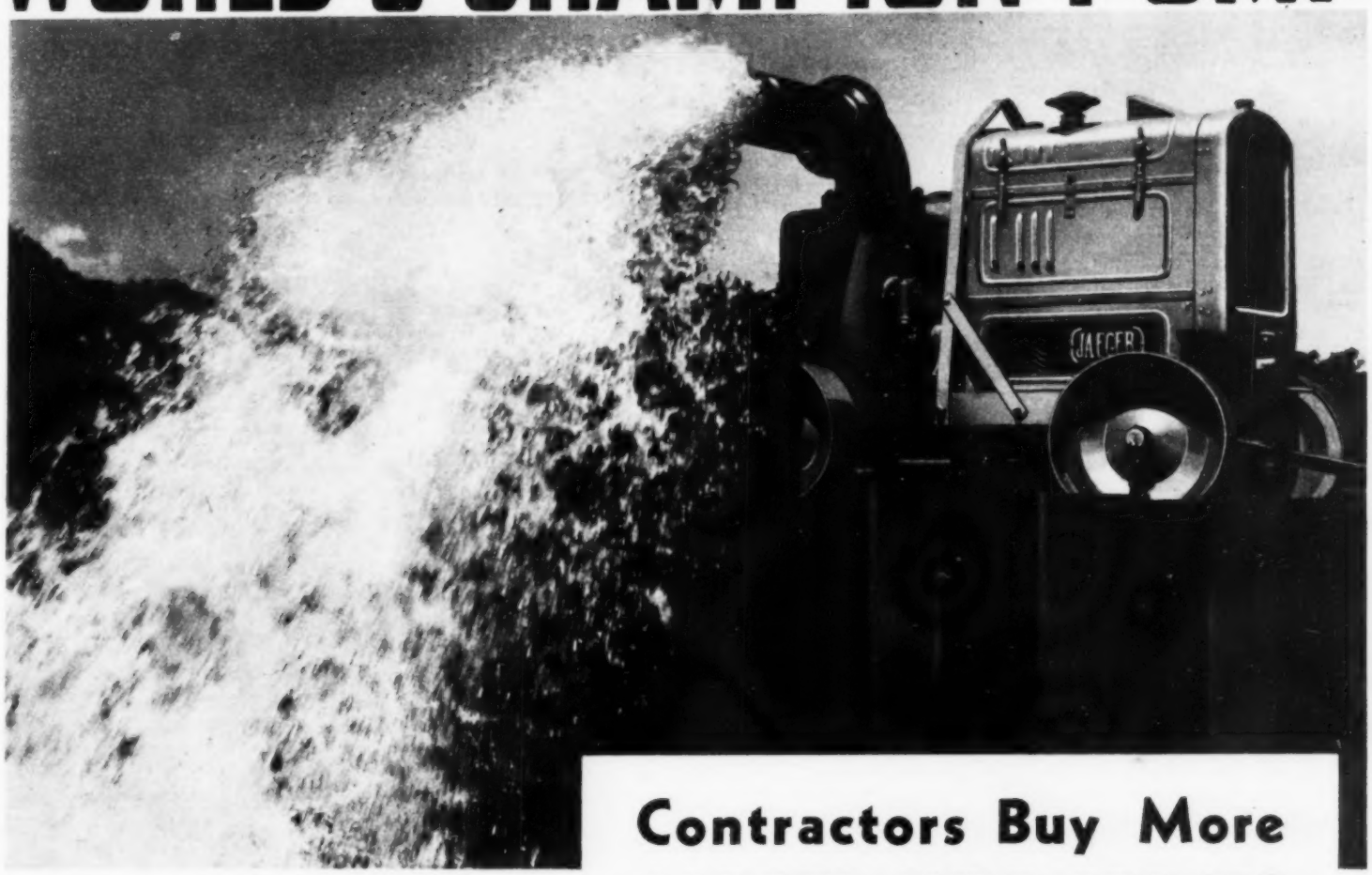
Here is boom strength backed by crowding force and engine power that makes the Northwest a real Rock Shovel.

●

NORTHWEST ENGINEERING COMPANY
1728 Steger Building
28 E. Jackson Boulevard
Chicago, Illinois

NORTHWEST

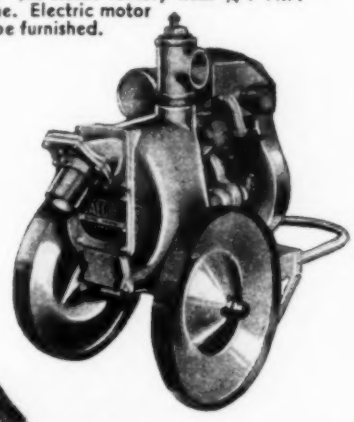
WORLD'S CHAMPION PUMP

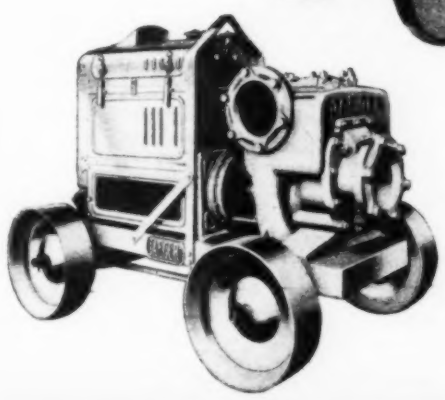


ABOVE: Model 10PH "Sure Prime", 220,000 G.P.H.

World's Champion Bantam Pump — ONLY 52 Lbs.

100% automatic priming, pumps 4000 G.P.H. at 30 ft. head. Aluminum alloy shell. $85 f.o.b. factory with ¾-1 H.P. engine. Electric motor can be furnished.





All sizes 1½" to 10" extremely compact. Up to 6" sizes on 2 wheels.

Self - Priming Dual - Purpose Jetting - Dewatering Pumps: One pump does work of two.

Contractors Buy More JAEGER SURE-PRIMES than Any Other Pumps . .

because: Jaeger gave the world the modern self-priming centrifugal whose small price and huge capacity revolutionized the cost of handling water,

because: Jaeger, alone, has the high velocity "Priming Jet"—30% to 50% faster priming, 100% automatic, 100% sure to prime even at maximum lifts, even (in hi-head models) against vertical heads exceeding 100 ft.,

because: Jaeger's patented Self-Cleaning Shell, Lubri-Seal, pump mounting, shaft and impeller are a marvel of engineering design, consistently delivering ***thousands of extra hours*** of unfailing service without stop or replacement of a single part,

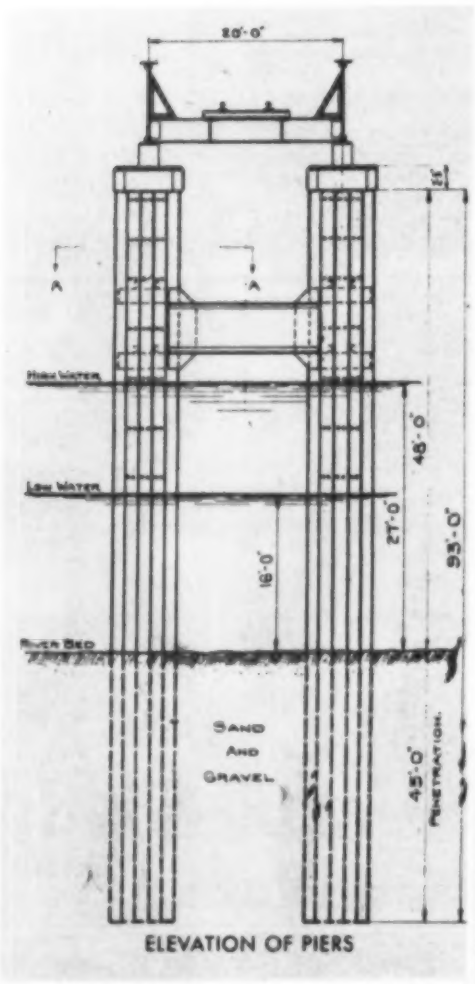
because: every pump Jaeger builds is individually tested for capacity and pressure before it ever leaves the factory.

Our latest Catalog P-39 describes the most complete line of pumps on the market for drainage, supply and well point work. Send for your copy and prices, today.

The Jaeger Machine Co., 800 Dublin Ave., Columbus, O.

WORLD'S LEADING MANUFACTURERS: CONCRETE MIXERS — PUMPS — HOISTS — TOWERS — TRUCK MIXERS — CONCRETE-BITUMINOUS ROAD MACHINERY

MZ-38 Piling Builds Railroad Bridge Pier *at a 60% Saving!*



ELEVATION OF PIERS

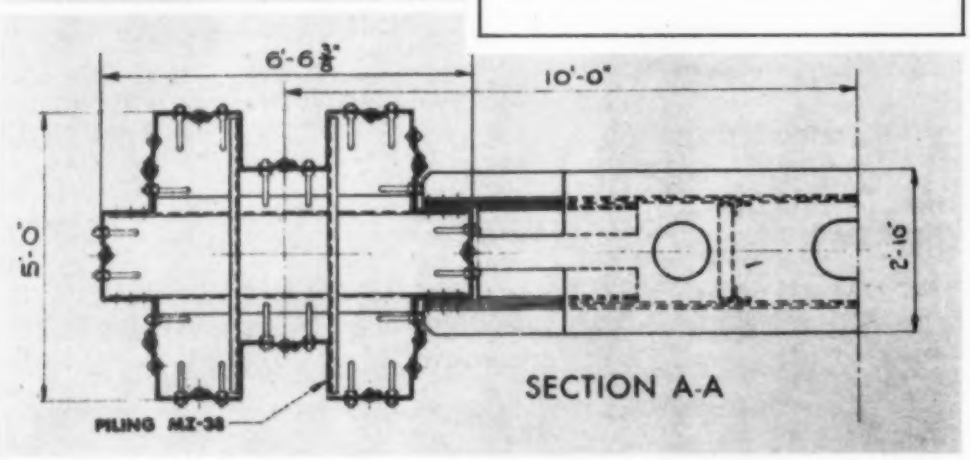
IN these two twin piers, U·S·S Steel Sheet Piling MZ-38 proves its versatility by doing an exceptionally fine bearing pile job at a 60% saving over the cost of one center mass pier for two truss spans.

Each twin pier supports a total superimposed load of approximately 2,000,000 pounds. This is carried primarily by the sheet piling, supported by skin friction in the sand and gravel which is adequate to support entire load. Each MZ-38 Pile, including the corners, supports an average of 42 tons. (Although piers were concrete filled after sheet piles were driven, no bearing value of the concrete on the enclosed sand is necessary for support of the loads.)

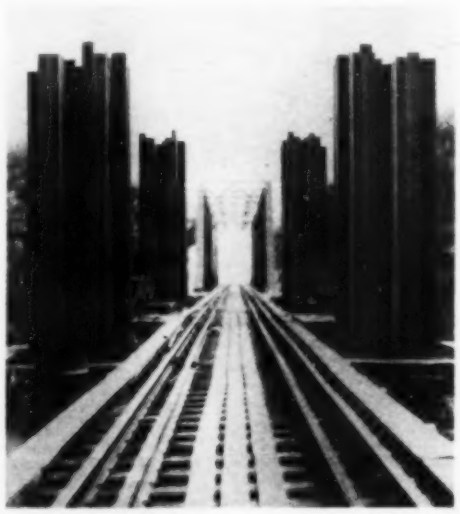
Sheet Piling pier construction like this has the double advantages of maximum speed and minimum cost. It requires no cofferdam, no form work, no excavation. Involves no delay in construction, offers minimum obstruction to stream flow. And in addition it provides a practical construction to take care of very deep scour conditions at least expense.

U·S·S Steel Sheet Piling is available in the most complete range of dimensions and sections — straight-web, arch-web and the new "Z" sections illustrated here. Call on us for helpful cooperation of our piling specialists — they may be able to save you money too.

River bed at the bridge site is glacial drift about 150 ft. to rock and consists of sand, gravel, clay and large gravel. River scour is about 15 feet at site. The MZ-38 Piling in 93 foot lengths was driven to a depth of 45 feet by a McKiernan-Terry Hammer to a resistance of 20 to 25 blows per in. for the last 5 feet, and for the last foot, 30 blows per in.



SECTION A-A


NO INTERRUPTIONS! By placing each pier outside the clearance line, both twin piers were built without any interruptions of traffic. This type of construction is independent of water hazards because it is built in small units which are readily handled in swift water or where stream is subjected to rapid and considerable fluctuations of stage as was the case here.

U·S·S STEEL SHEET PILING

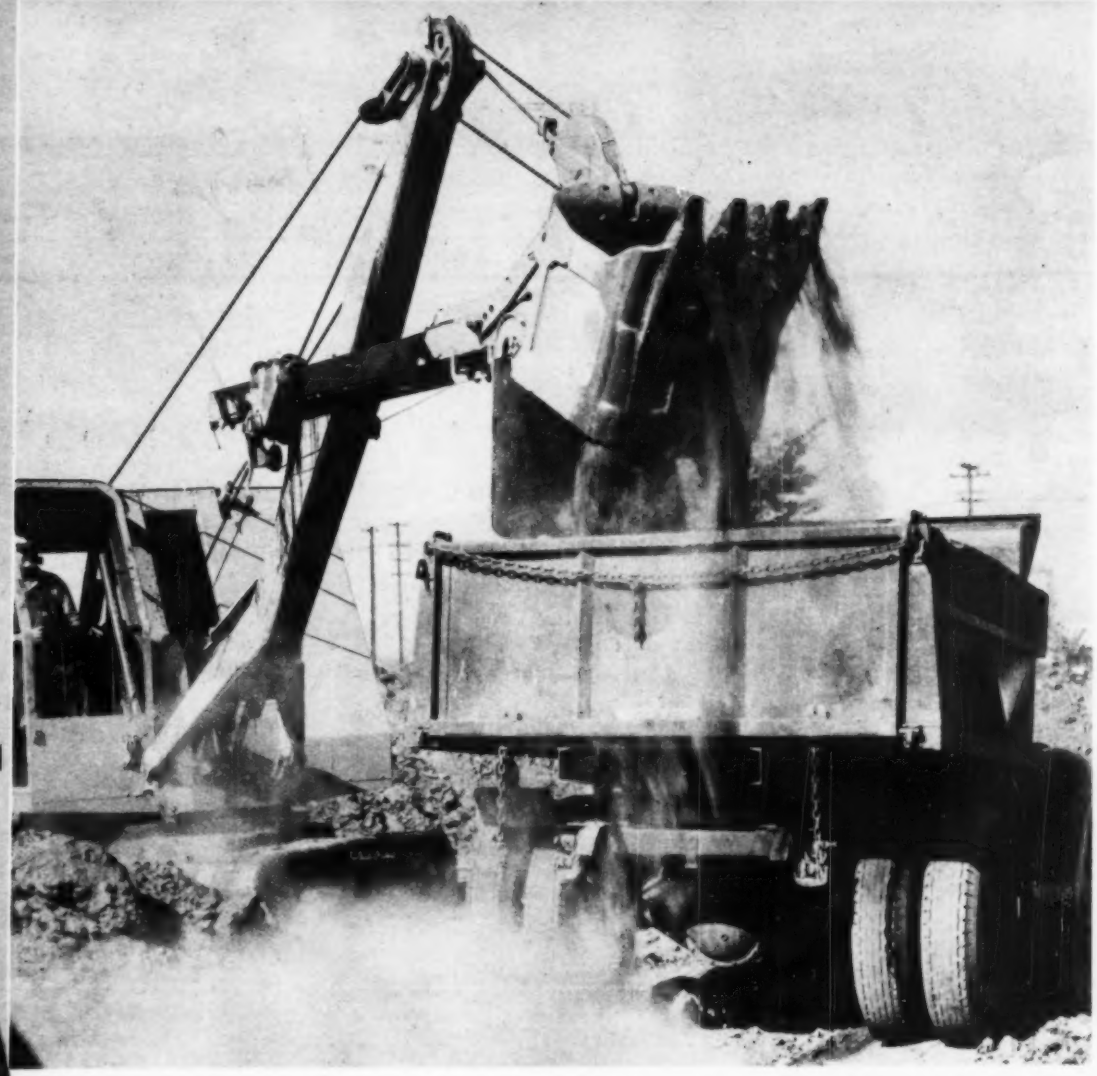
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

BAY CITY Action

MEANS MORE YARDAGE • MORE PROFIT



One of two BAY CITY Shovels owned and operated by H. M. Jones of Los Angeles.

That is what you get when the speed, power and easy operation of standard BAY CITY design is put to work in tough digging. Unit-cast alloy bases • Sturdy one-piece chain crowd • Fast, easy steering and travel • Instantaneous electric dipper trip • Quiet, powerful helical gears • Frictionless bearings throughout • "E-Z" control booster operated clutches — to mention only a few of the many features that insure *greater action* with a BAY CITY *at lower cost*. For complete details and specifications ask for your copy of Catalog H-2.

BAY CITY SHOVELS, Inc., Bay City, Michigan

Export Office: H. M. Hein, 330 W. 42nd St., New York (Oparo)

BAY CITY SHOVELS

25 YEARS *of* SERVICE

HAVE YOU SEEN THIS BOOK?

WRITE FOR CATALOG H-2!

The Bigger the Job

. . . THE BIGGER THE CHANCE OF LOSING YOUR SHIRT

. . . but with Cummins Dependable Diesel power you eliminate chance. Contractors know with Cummins Diesels they can bid more accurately, schedule more surely. Costly interruptions to the working cycle are eliminated with the Cummins Diesel's unfailing performance under all types of load and road conditions. Cummins Diesel's low maintenance assures the contractor that his fuel economy will not be dissipated in costly parts, labor and service. By eliminating chance, big jobs can really mean bigger profits when Cummins Diesel power is used.

Let your Cummins dealer give you the "Job-test Evidence." Cummins Engine Company, 1716 Wilson Street, Columbus, Indiana.

Ten Cummins Diesel-powered Sterling tractors will haul rock for two stone jetties to be constructed to protect the historic Barnegat Lighthouse and the city of Barnegat. Each tractor will pull a 17-ft. semi-trailer with three skips loaded with 30,000 to 40,000 lbs. of rock. Length of haul, 77 miles.

CUMMINS
Dependable
DIESEL
PIONEER IN MODERN DIESEL DEVELOPMENT

There's nothing like it

54 cu. in. of vital construction data

ENGINEERING NEWS-RECORD

1939 ISSUE of Construction Costs April 27

(12th edition of this yearbook)

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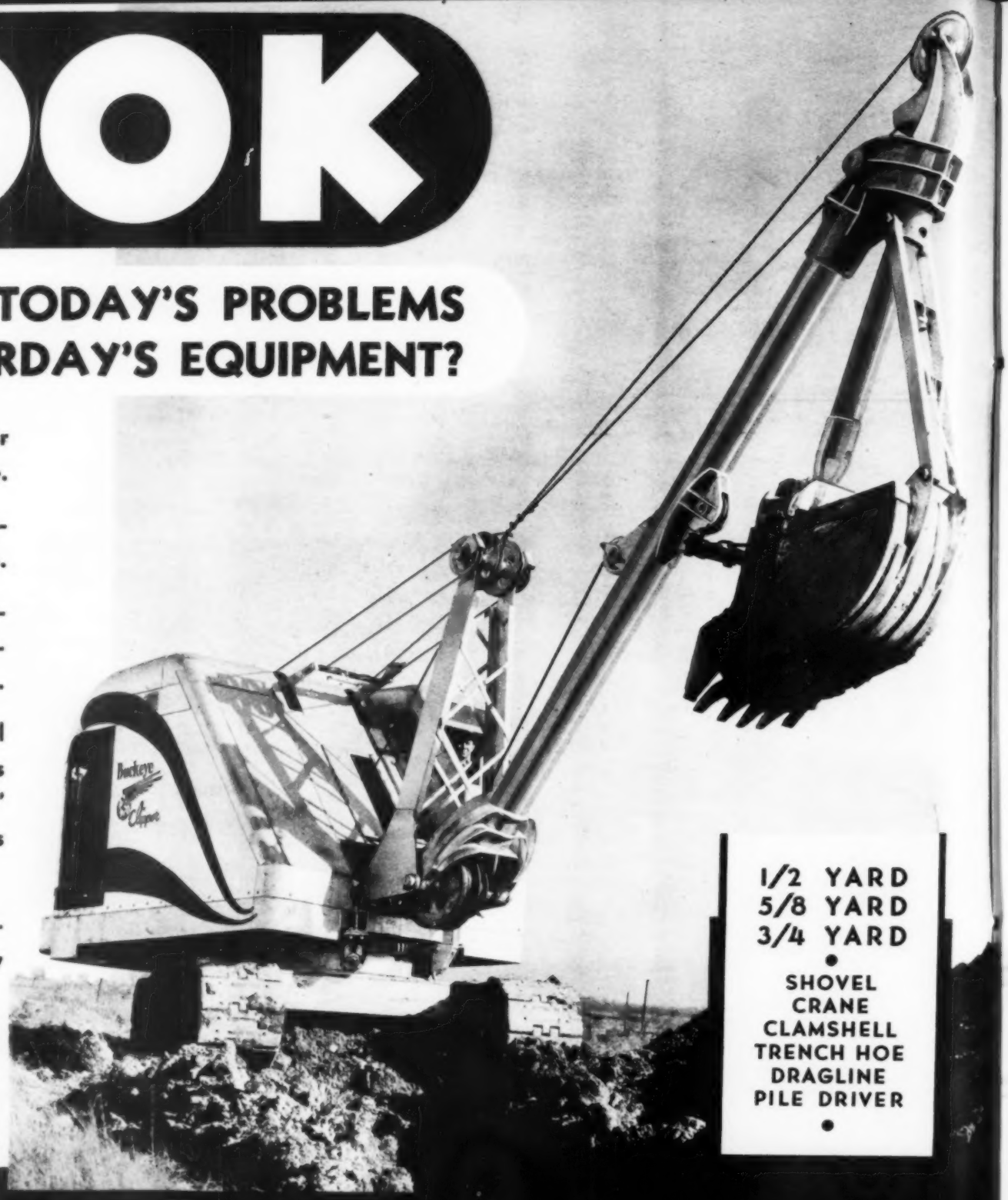

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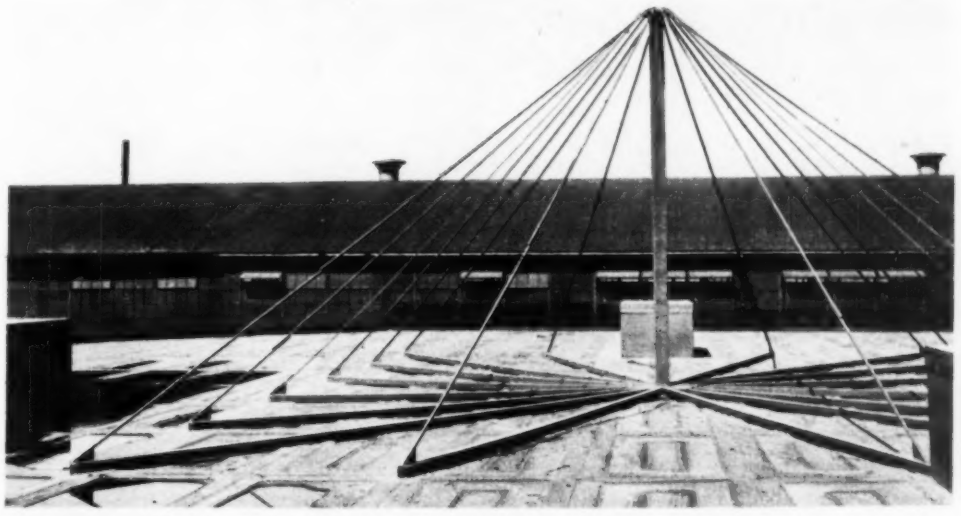
Volume 21 | March, 1939 | Number 3

"UMBRELLA STAYS"

Support Welded Warehouse Roof

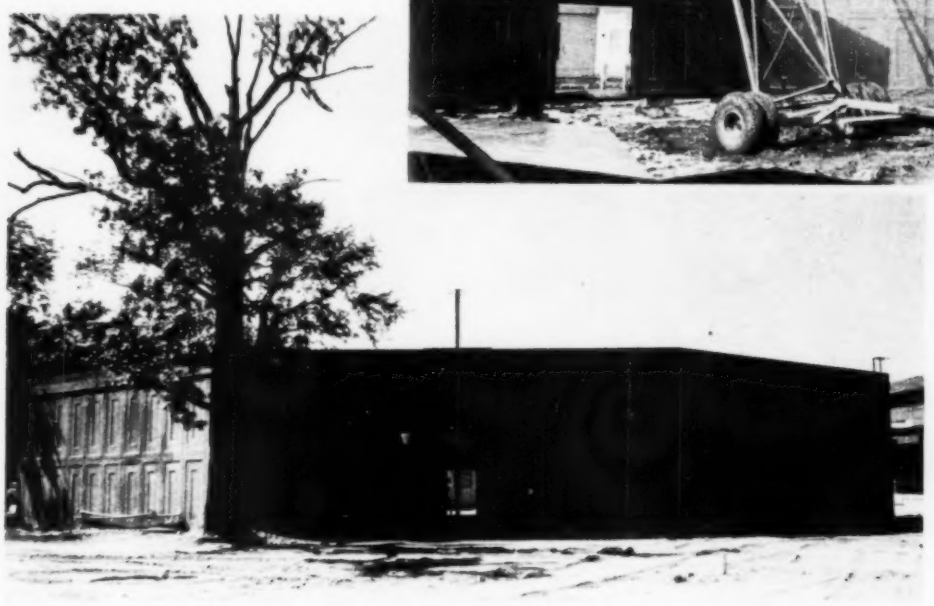


UMBRELLA STAYS extending from top of single welded box-beam column support roof of warehouse.

AN UNUSUAL STRUCTURE—a large octagonal warehouse, the roof of which is supported on one single center column, with "umbrella stay" framing—is to be seen at the plant of R. G. Le Tourneau, Inc., manufacturer of tractor-drawn earth moving equipment, Peoria, Ill. This building presents an unusual inside appearance. The floor space is entirely clear except for a single center column, a 6x6x½-in. box-beam of arc-welded construction.

Construction is entirely of shop-fabricated panels consisting of an inner and outer plate separated by a distance of 10 in. in the roof and 4 in. for the walls. The framing of the panels consists of stampings punched at various intervals along their length to prevent conduction of heat and cold. These stampings, to which the inner and outer plates are rigidly joined by arc-welding around the outer edges, plus spacer bars to maintain uniform space, are the only members serving as framework.

STEEL ROOF PANEL is swung into place by mobile hoist operated by tractor.



ARC-WELDED PANELS (left) form sides of Le Tourneau warehouse, while "umbrella stays" from single center column support roof.

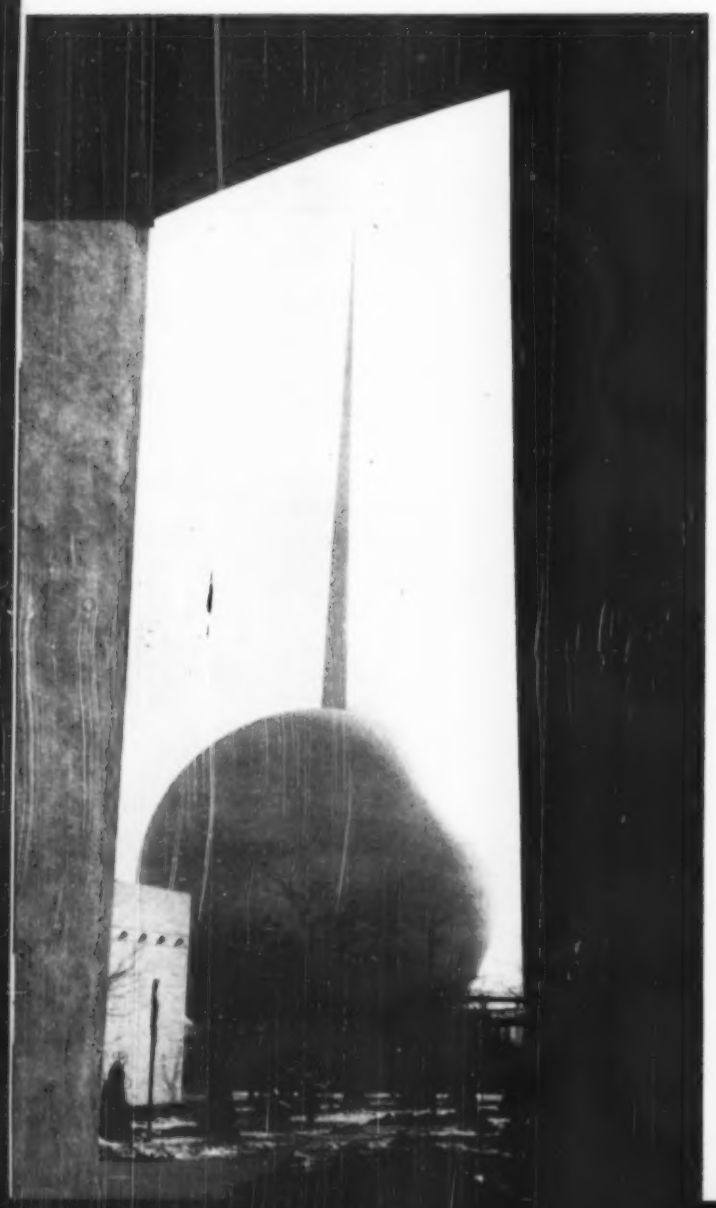
The roof of the structure actually hangs from the single column which extends above the roof. It is held by 16 rods arc-welded to the top of the column and to small box beams extending out, fan-like, from the column and arc-welded to the roof panels. The arrangement resembles the stays of an umbrella.

Erection of the structure consisted simply of placing the one-story shop-welded wall panels, arc-welding the seams between and then applying the roof which was supported by shoring until all roof panels were placed and the supporting hangers and all seams welded. Following the welding, the temporary columns were removed, leaving the roof supported only by the "umbrella-stay" framing. Two bands of plate are arc-welded around the eaves to close the roof panels. Lincoln Fleetweld electrodes were used for the welding. The warehouse is air-conditioned and completely insulated by rock wool blown into the panels of walls and roof at intervals during erection.

FLOOD PROTECTION (left) for Los Angeles County, Calif., involves a $70,000,000 program of channel improvement and dam construction being carried out by the U. S. Engineer Department. In the photograph herewith a Ransome paving mixer is delivering concrete for placement by crawler crane and bucket in a retaining wall to keep the Los Angeles River within bounds.

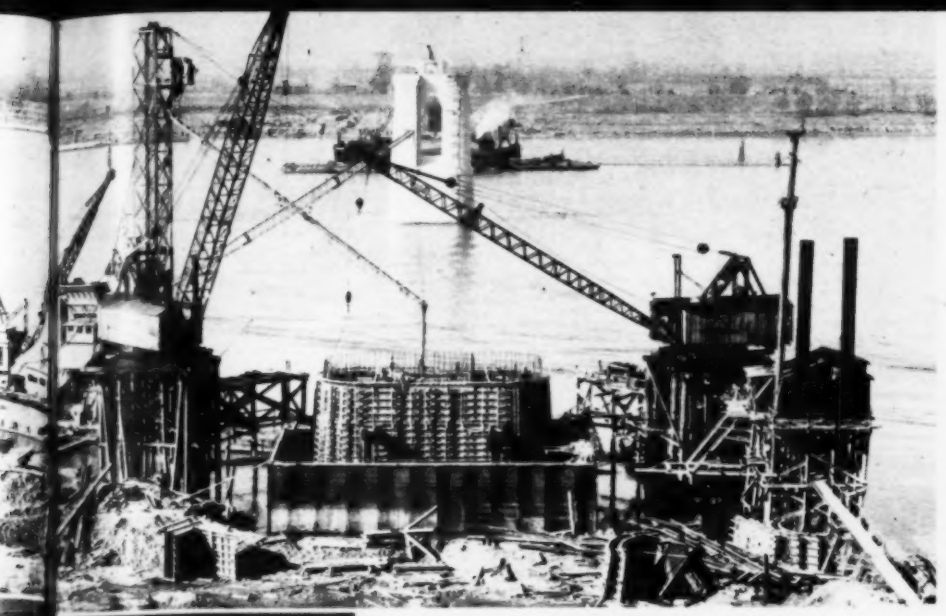
This Month's
"NEWS REEL"

THEME STRUCTURE (below) is ready for opening, April 30, of New York World's Fair, 1939. Structural Steel frames of 700-ft. Trylon and 200-ft. diameter Perisphere are inclosed with Gyplap sheathing nailed on 2x4-in. studs and covered with Tymstone magnesite stucco on burlap backing and finished by brushing with rubber-base paint of off-white color.

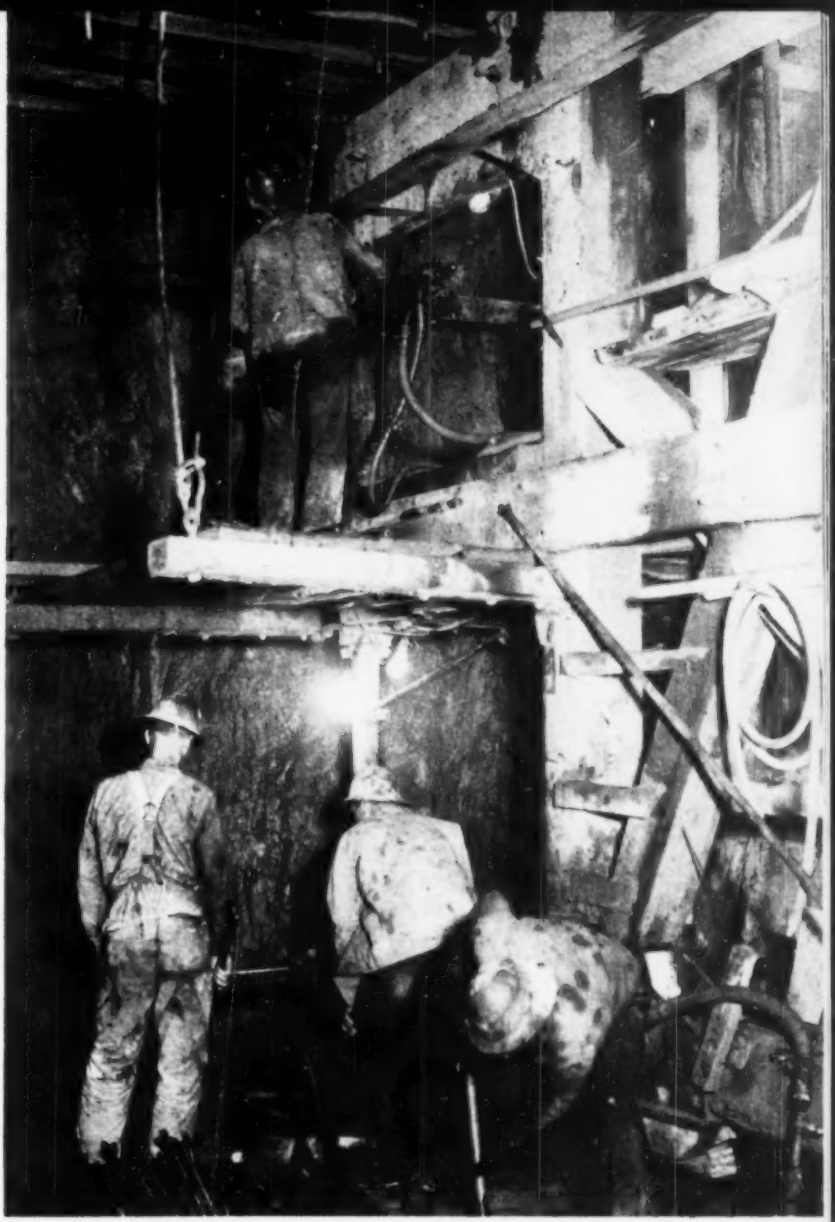


RED HOOK HOUSING PROJECT (below), covering 40 acres in Brooklyn, N. Y., progresses under sponsorship of New York City Housing Authority. Estimated cost is $13,000,000. There will be 25 apartment buildings and 4 community buildings, providing 2,541 living units. Apartments averaging 4.14 rooms each will, it is indicated, rent for $26.55 per month. Contractor for project is George A. Fuller Co., of New York City. Buildings will occupy only 17.5 per cent of land area.

TREASURE ISLAND, man-made site created by dredging from San Francisco Bay, is scene of opening of Golden Gate International Exposition last month. Lofty Sun tower is focal point of group of fair buildings.



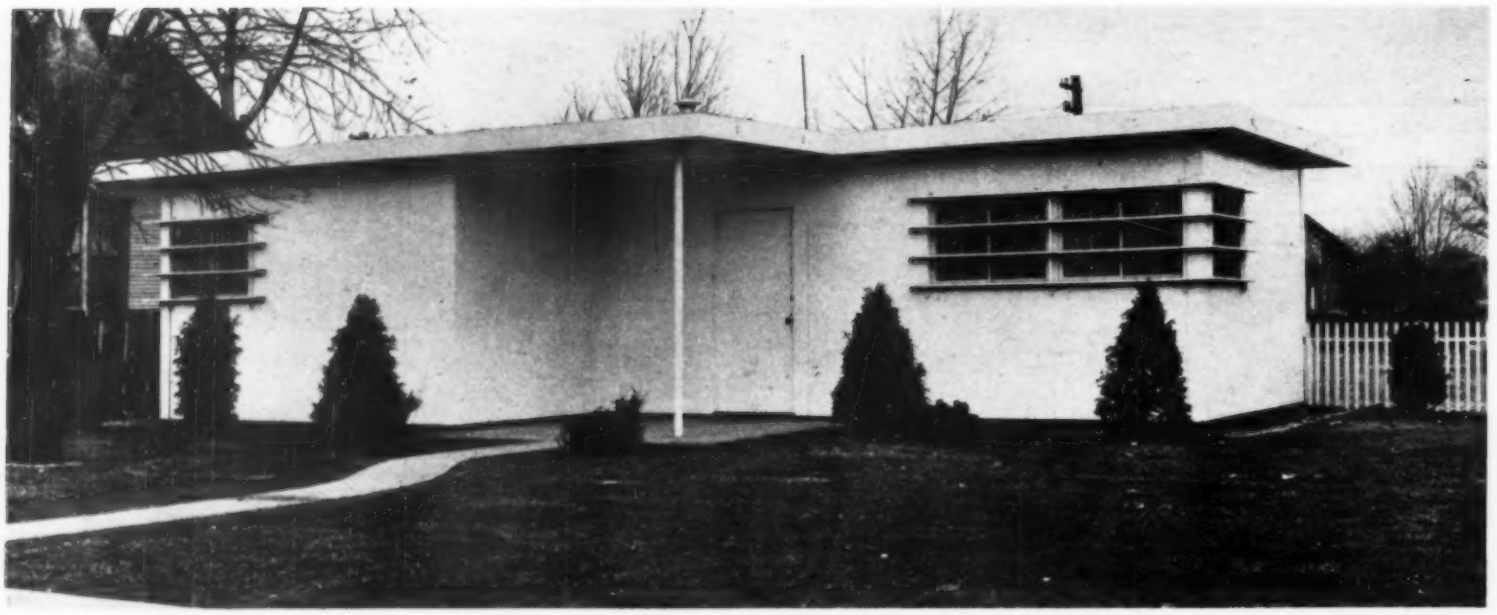
MISSISSIPPI RIVER BRIDGE at Baton Rouge, La., reaches stage where concrete shafts for deep piers of substructure rise above water level. View looking west from east bank shows, in foreground, forms in place for pier 2; in center foreground pier 3 is completed and, behind it, appears top of completed pier 6, with work on shafts for piers 4 and 5 progressing in between. Highway and railway structure, to cost $8,361,000, is being built under direction of Louisiana Highway Commission, H. B. Henderlite, chief engineer and N. E. Lant, bridge engineer. Low bidder for river substructure was Kansas City Bridge Co., with price of $2,421,980. Total length, including approaches, will be 12,226 ft. of which 3,326 ft. will span river.



BY-PASS TUNNEL, to carry flow of Sacramento River around site of U. S. Reclamation Bureau's Shasta dam, main feature of Central Valley project in California, is advanced by drill crew of Pacific Constructors, Inc., whose bid for big job was $35,939,450. Completed dam will be 560 ft. high and 3,400 ft. long, and will require placement of 5,400,000 cu.yd. of concrete.

BIG AIRPLANE HANGAR (left) takes form at McCord Field, Fort Lewis, Wash., as Universal Lorain 13-ton truck-crane with 80-ft. boom and 30-ft. jib extension sets steel for structure 400 ft. long and 30 ft. wide. Included in project awarded to Sound Construction Co. for $806,248 are four hangars, to be built in pairs. Steel erection is by Bethlehem Steel Co. Standard boom of all-welded construction, is made up of a two-piece 25-ft. boom plus two 25-ft. and one 5-ft. center sections.

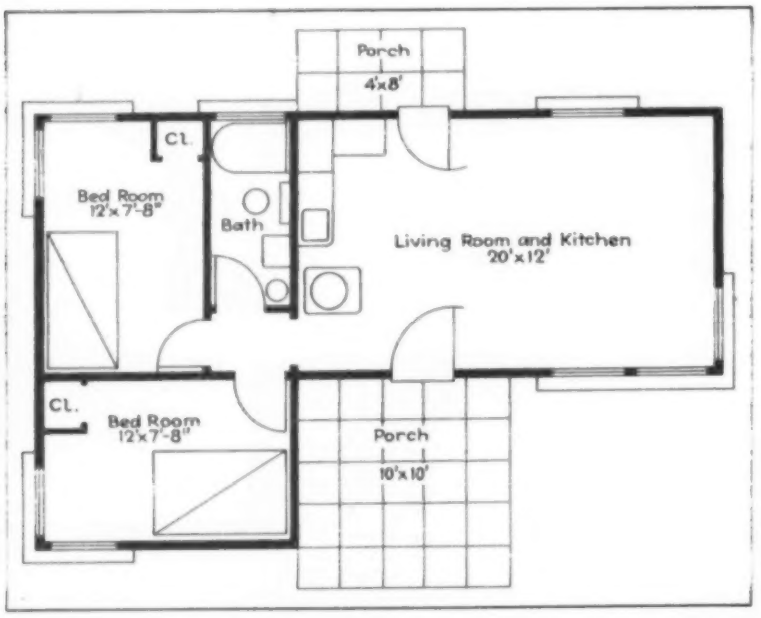
LAST STEEL MEMBERS (below) are placed in floor system of $18,000,000 Bronx-Whitestone bridge, New York City. Structure being rushed to completion by American Bridge Co. in time for handling traffic during New York World's Fair, has 2,300-ft. main cable suspension span crossing East River and 735-ft. side spans. Project is being built under direction of Triborough Bridge Authority, O. H. Ammann, chief engineer.



READY FOR RENTAL at rate of $2.50 weekly. Painted plywood panels, prefabricated at site, form walls and roof of one-story structures at Fort Wayne. Cost of materials and overhead for each structure is approximately $900.

LOW-COST HOUSES

Built to Rent for $2.50 Weekly



FLOOR PLAN indicates arrangement of 12x20-ft. combined living room, dining room and kitchen, two 7 ft. 8 in.x12-ft. bedrooms and 4x9-ft. bathroom.

UNSKILLED LABOR ERECTS PREFABRICATED PLYWOOD PANELS FORMING ONE-STORY STRUCTURES

By J. STANLEY YOUNG

Project Architect,
Fort Wayne (Ind.) Housing Authority

BUILT to rent for $2.50 weekly, 50 one-story houses of prefabricated plywood panels have been erected with unskilled labor in Indiana by the Fort Wayne Housing Authority to replace dilapidated, insanitary shacks and rehouse 50 families previously living in crowded, inadequate quarters. The low rental was achieved with the use of private capital operating with the Federal Housing Authority and the Works Progress Administration.

The cost of all materials (including those for sewer and water connections and landscaping) and overhead was less than $900 per house. Overhead included office and factory rental, light, power, telephone, truck rentals, insurance and factory equipment. WPA labor costs, not yet available in detail, showed a constant downward trend as experience increased the smoothness of line production operations. Even with the high early average, and including sewer and water connections, they are expected to average less than $700 per house.

With regard to activities of WPA

TYPICAL DILAPIDATED SHACK (right) in Fort Wayne, Ind., which new one-story houses are replacing.

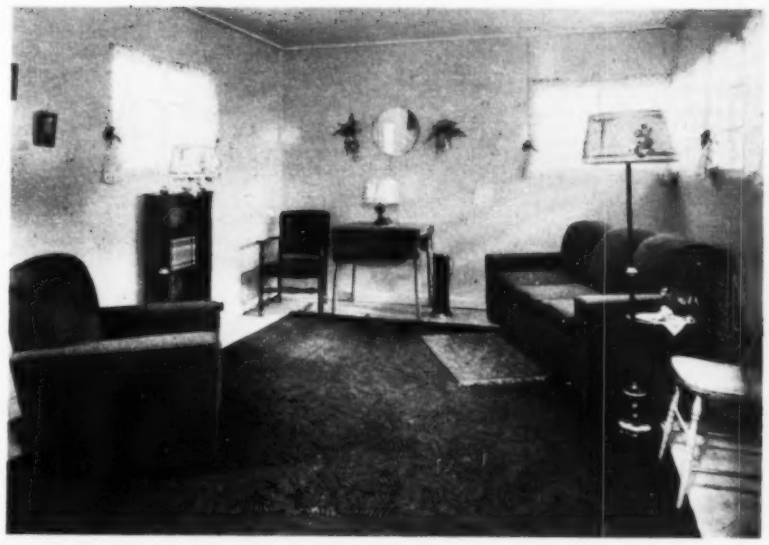
in the construction field, the sponsors of the Fort Wayne project claim that the legitimate construction industry has not operated, and cannot hope to operate, for the benefit of the low-income group that the Authority is assisting. Only families whose incomes do not exceed $60 per month are being rehoused. This project, started frankly as an experiment, has attracted nationwide interest. Fort Wayne plans to build another 150 houses as soon as possible, and other cities are seriously considering the adoption of similar programs.

The following notes describe how these FHA-WPA houses were developed and built. They were designed by the author, associate architect of the Federal Housing Administration in Washington, D. C., working with Frank Watson, housing economist and director of the Municipal Housing Division of FHA. The services of Watson and Young were given by FHA to the Fort Wayne Housing Authority. They specified materials, set up the plant and supervised all operations, assisted by a third man, Paul Ulmer, also an associate architect of FHA.

Design of Houses

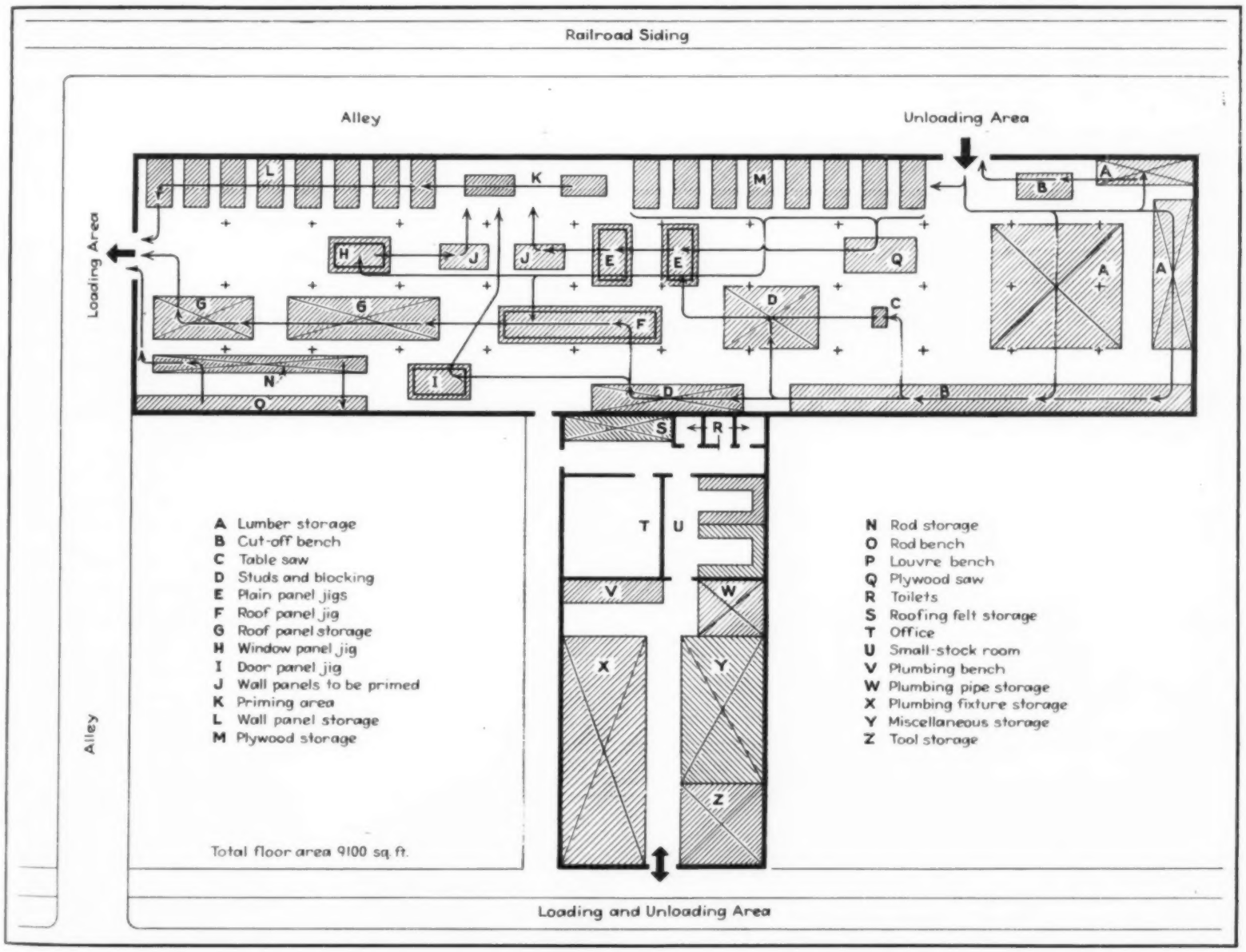
All 50 houses have the same floor plan, illustrated herewith. Each contains a combined living room, dining room and kitchen 12x20 ft., two bedrooms 7 ft. 8 in. x 12 ft. and a bathroom, 4x9 ft., containing the usual fixtures. They are heated by an oil-burning space heater that contains a water coil for heating domestic hot water and storing it in a 30-gal. tank in the bathroom. No basements or attics are provided.

Each bedroom has cross-ventilation and contains a clothes closet. The windows slide horizontally on metal tracks. A definitely "modern" character has been achieved with corner windows screened in an unusual manner. Horizontal wood louvres act as screen frames and give a play of light and shade on the exterior that is unusual and interesting. The flat roof, also "modern" in character, is another unusual feature. The designers claim that it is altogether practical and much more economical of material and labor than the conventional pitched roof.



FURNISHINGS are installed and house is ready for occupancy 5 days after plywood panel shell is erected.

The construction system is based upon recent studies made by the U. S. Forest Products Laboratory at Madison, Wis., and the Housing Research Department of Purdue University. This system uses plywood box-beam panels. Panels used for the walls and partitions measure 4x8 ft.;

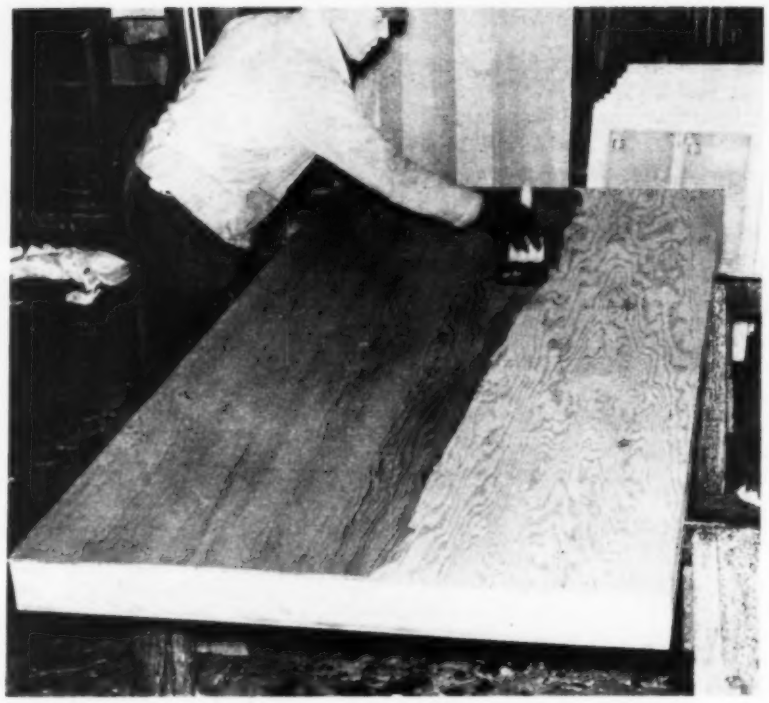


PLANT LAYOUT for fabrication of plywood panels forming walls and roofs of houses shows location of equipment and flow line of raw materials into finished products.

1 **PANEL FABRICATION** operations start at cut-off bench where all framing members are cut to exact dimension and drilled for steel rods.

2 **PAPER TUBES** of 3-ply material are inserted in holes of framing members to act as guides for steel rods.

3 **ROCK WOOL INSULATION (below)** is packed between members of all wall, partition and roof panels.
PANELS are made in jigs. Hot-pressed phenolic-resin fir plywood is glued and nailed to both sides of 2x4-in. framing members.



4 **PRIMING** of panels is done at fabricating plant by brushing on sealing oil.

for the roof, 4x24 ft. and 4x16 ft. These panels are built-up and primed in a plant near the site.

Plant Fabrication of Plywood Panels

An old plant in Fort Wayne was rented by the Authority and equipped for fabricating the various sections of the houses and storing carload shipments of materials. The plant layout, as indicated in the accompanying sketch, was determined largely by the structure itself, the location of the railroad siding and the truck-loading areas. Plant equipment included a cut-off bench for cutting all framing material to exact dimensions, a rod bench where rods were cut and threaded and packed in bundles for each house, a plumbing bench where some of the underground work was assembled, 5 jig tables on which the panels were made and the following powered equipment:

- 1 cut-off saw and
- 2 drill presses used at the cut-off table
- 1 plywood saw used to cut plywood for window and door panels
- 1 table saw for ripping and curfing dimension lumber
- 1 hack-saw for cutting rods

The production of the house shell starts at the cut-off bench where all framing members are cut to size and drilled for steel rods. Stops are so placed on this bench in relation to the saw and drills that no measuring is necessary and all pieces required can be turned out with a minimum number of operations.

From this bench two-thirds of the studs for wall panels are taken to the table saw where a groove about ¾ in. deep is cut in one side. This groove or curf is made to receive a steel spline placed between the panels at erection.

Four types of panels were fabricated: Plain wall panels, door panels, window panels and roof panels. Each house consists of 21 plain wall panels, 9 window panels, 6 door panels, six 24-ft. and three 16-ft. roof panels. Panels were assembled at the jig tables.

The jig tables for plain wall panels, door and window panels are exactly alike. Each is built of heavy lumber and measures approximately 6x10-ft. with the working surface about 25 in. above the floor. A piece of plywood, 4x8 ft., glued to the table top, has built-up on two sides frames about 6 in. high solidly and squarely held by angle irons. The other two sides are equipped with frames of the same height but made adjustable with screw clamps. A plain wall panel was assembled in the following manner:

The clamps are loosened, three studs placed loosely in position and 3-ply paper tubes (for steel rods) inserted in the holes. Blocking is then put in position and the clamps tightened so that framing members (all 2x4s) form a panel exactly 4x8 ft. Cold-resin, quick-hardening glue is then liberally applied to edges of all members.

A 4x8-ft. plywood sheet of fir, ⅜ in. thick, hot-pressed and bonded with phenolic-resin glue is then placed on the frame work and nailed on 6-in. centers to it. The clamps are loosened and the panel (about half made) is moved to another jig and clamped in place with its plywood side down. Rock wool from

rolls 23 in. wide, 8 ft. long and 3⅜ in. thick, is then packed between framing members, glue is applied to the edges of all members as before and a second sheet exactly like the first nailed down. Clamps are loosened and the panel is placed on a pile, ready for priming.

Window panels, door panels and roof panels were all made on their own jigs in a similar manner, and all insulated with rock wool. Framing members for roof panels, however, were 2x6s and the upper roof surface made with ½-in. instead of ⅜-in. plywood. After the various panels are assembled and primed they are stacked near the loading door, ready for trucking to the sites.

The rod bench is equipped like the cut-off bench with stops so that the hack-saw can cut the rods (34 and 38 ft. in length) into the various shorter lengths required, without any measuring. A chart here, and at the other bench, specifies how many pieces to cut at stop No. 1, how many at No. 2, etc. for each house. The rods are threaded and bundled in sets, washers and nuts counted out, then sacked and wired to each set.

Another bench is used for prefabrication of some of the underground plumbing. Sections of soil pipe, the bath drain and closet bend are calked and leaded at this bench on a jig. The assembled sections are stacked for use as needed at the sites.

All operations in the plant were keyed to the production of enough panels, louvres, sets of rods, trim, etc. for one house per working day.

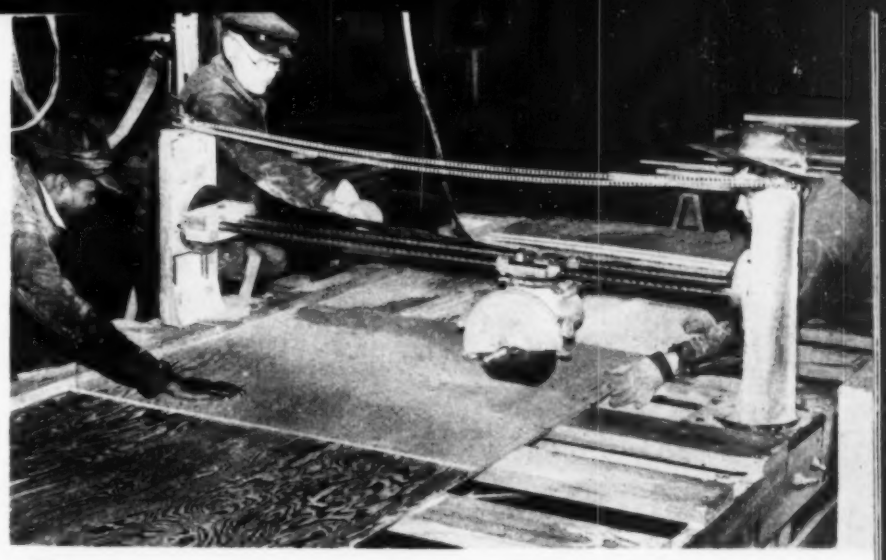
Purchase and Storage of Materials

Materials for the fifty houses were purchased and stored in as large quantities as possible. Dimension lumber, plywood, plumbing fixtures and roofing materials were bought in carload lots. Limited storage space at the plant, however, permitted the storage at one time of only 2 carloads of lumber, of the 6 required, 2 carloads of plywood, of the 4 required, 1 carload of plumbing fixtures and 2 of roofing materials. Rock wool was delivered under contract in quantities of approximately 8,000 sq.ft. Electrical materials, hardware and paint were delivered under contract in quantities sufficient to take care of ten houses as required.

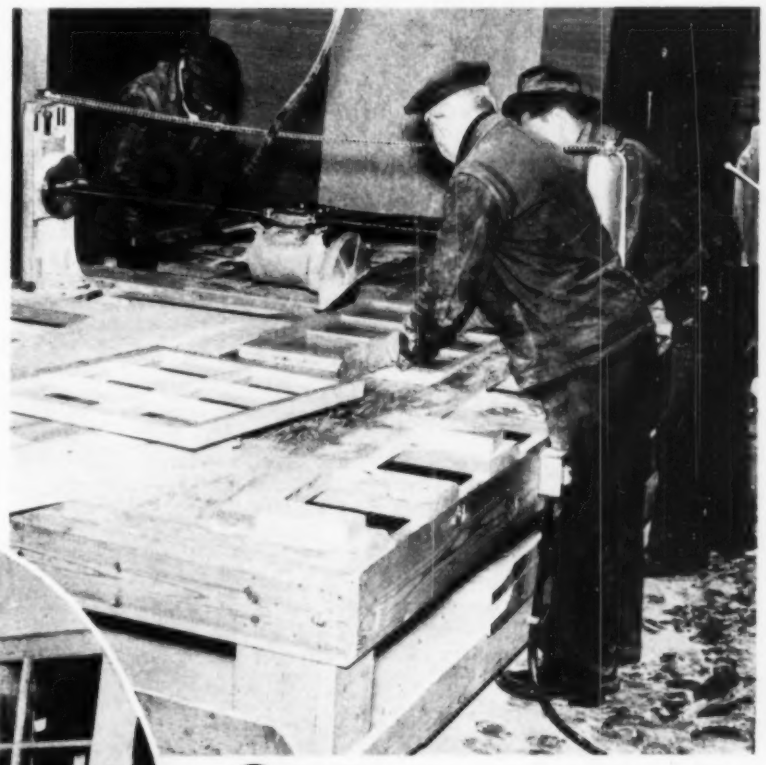
Concrete Slab Foundations

Work at the sites started about three weeks before the fabricating plant was set in operation. This was done so that the concrete slabs, to serve as floors in the houses, would have ample time to cure before erection crews touched them. The sites, city lots located only on streets where water and sewer lines were accessible, were selected from those offered for good natural drainage and contours requiring minimum cut and fill work.

First work at the sites was the placing of stakes outlining the house slab. All weeds and debris then were removed from the lot and the top soil stripped from the house site. Trenches next were dug for the water and sewer lines. Copper pipe, ¾-in. type K, was laid for water service, 4 and 6-in. vitrified tile for sewer lines. Underground plumbing was placed in proper relation to the slab, trenches filled, the earth puddled and tamped. Forms for the slab were then placed, bolted together and



5 **CIRCULAR SAW** cuts pieces of plywood required for trim, door and window panels.

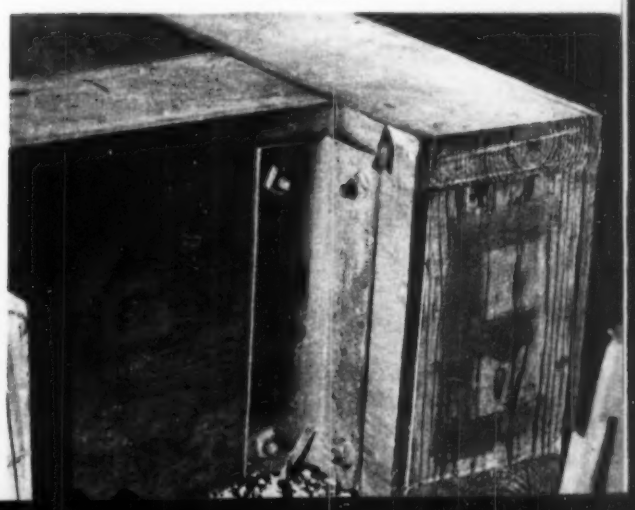


6 **TRIMMING** of bottom rail of stock window sash is done with electric saw.

7 **SASH (left)** is placed in window panels at fabricating plant; one-half of window is fixed and other half slides on track.

9 **COARSE GRAVEL FILL (below)** is placed within concrete foundation walls and tamped to provide minimum thickness of 4 in. (increased to 8 in. at perimeter) for concrete floor slab.

8 **FORMS (below)** for concrete foundation walls are made of ¾-in. plywood glued and nailed to framing members. They are bolted together at the site. Five sets of forms were used for the 50 houses.



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FLOOR SLAB (left) is concreted with truck-mixed concrete, screeded to smooth surface. Canvas tent and salamanders protect fresh concrete during curing period in freezing weather.

leveled to the elevation determined by the architect.

A course gravel fill 4 to 8 in. deep was placed within the forms and tamped, leaving a minimum of 4 in. to top of forms. A 4-in. concrete slab reinforced with wire mesh was floated over the gravel. No foundation walls or footings were provided. This type of floor was selected as being the most durable and comfortable that could be used considering cost. The slab, it is claimed, takes the earth temperature, is warmer in winter and cooler in summer than an under-ventilated floor. Ready-mixed concrete showing strength of 2,500 lb. in 28 days was specified. The slabs were screeded, then steel troweled to a smooth finish.

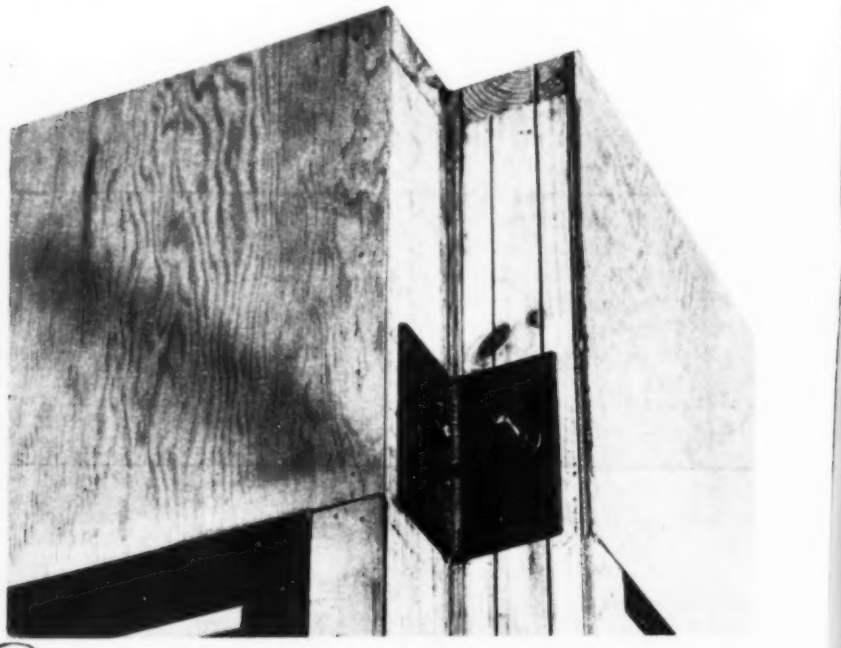
Since most of the work was done during the winter months precautions had to be taken to protect the ground and slabs from freezing. A tent, made to order, was used at each site. Salamanders were placed under it and fired long enough before any pouring was done to assure unfrozen ground. Concrete at a temperature of 70 deg. F. was poured and the salamanders kept going for at least 12 hr. in freezing weather. After that time the slab was covered with resin paper and about 1 ft. of straw and the tent moved to the next site. The schedule of one slab per working day was maintained in this manner. The slabs were allowed to cure for at least 2 weeks before erection of the shells.

Erection of Houses

Three truck-loads of panels were used in each house. The first load consisting of all the wall panels, 36 in number, usually arrived at the site about 7:30 a.m. They were unloaded, set in place on the slab with steel splines calked between each panel, plumbed and bolted together by 8:30 a.m. The second load consisted of four 4x24-ft. roof panels. These were lifted into place with the aid of a lifting tree. The last load was made up of four 4x24-ft. roof panels and three 4x16-ft. panels. These were usually in place and bolted to the other panels by 12:30 p.m.

Wall panels are bolted together through all walls near the top and bottom, roof panels on 4-ft. centers. Vertical rods at the corners of the

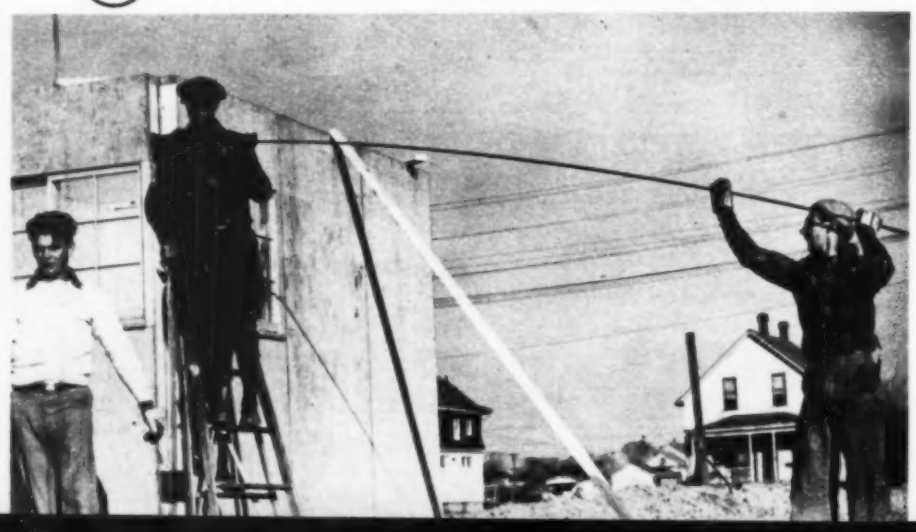
11 **TRUCK LOAD OF PANELS** arrives at building site at 7 a.m. and 12:30 p.m. of same day all wall and roof units for structure are erected and bolted together.



14 **STEEL ANGLES** at corners hold walls in alignment and take wall rods on threaded ends of which nuts are tightened.

12 **ERECTION CREW** of unskilled labor places first panel of building shell. Panels overhang edge of concrete foundation slab about ¾ in. Steel splines between panels are calked.

13 **STEEL RODS** are inserted through all wall and partition panels to tie structure together near top and bottom.



house hook over the roof rods and into eye-bolts embedded in the slab. Turnbuckles make them taut. The house is thus firmly held to the slab.

Finishing crews moved on the heels of the erection crews. They placed corner boards, base and ceiling molds, hung the doors and surface-mounted all hardware. Plumbers set fixtures and placed the pipes. All piping was delivered to the sites precut and threaded, ready for assembly.

A roofing crew worked on the houses at the same time as the finishers, laying a 4-ply, 17-yr. specification, built-up roof with graveled finish. *At the end of the second day, the house was ready for the painters.*

The painters applied second and third coats to all ceiling and wall surfaces. The final coat was made with a glossy finish to permit easy cleaning.

A circular galvanized flue is provided for the oil-burning heater. This flue has a 2-in. vented air space and 2 in. of rock wool insulation between wooden roof members and the 6-in. smoke pipe. The smoke pipe is removable for replacement when necessary.

Five days after the shell was erected, many of the houses were finished and ready for occupancy. Cold weather, in some cases, held up outside painting and landscaping, but starting Dec. 1, about three families per week moved into their new quarters.

Costs

The cost of all materials and overhead was under $900 per house. Overhead included office and factory rental, light, power, telephone, truck rental, insurance, factory equipment, etc. WPA labor costs are expected to average less than $700 per house.

Lots

Lots were acquired for $1 each. Owners were given options to repurchase the lots for $1 after 5 yr.; before 5 yr. by paying $150 to cover cost of moving the house the first year, $100 the second, $75 the third, $50 the fourth, $25 the fifth and $1 thereafter. Plenty of lots, being held for possible future industrial expansion, were offered to the Authority on this basis. While held by the Housing Authority, these lots are tax-exempt.

Finance Plan

The 50-house program was financed by three local lending institutions. The loans, divided among them, total $45,000 and are secured by a first mortgage bearing 4½-per cent interest. This is tax-exempt. The mortgage is scheduled for amortization in 20 yr. Reserves are set up for maintenance and replacements. An estimated annual surplus makes possible complete amortization in 16 years.

The sponsors believe that a similar program set up to build 200 such houses could effect enough economies in construction, organization, the purchase of materials, equipment, etc., to permit a rental of $2 per week.

16 **THROUGH ROOF PANELS** steel rods are inserted on 4-ft. centers.

15 **ROOF PANELS** are lifted by hand from truck and placed in position.

17 **NUTS** are tightened on threaded ends of roof rods to tie roof panels.

18 **VERTICAL STEEL ANCHORAGE RODS (below)** at corners hook over roof rods and through eye-bolts embedded in concrete of foundation slab. Turnbuckles allow them to be tightened up.

EMPLOYEE RELATIONS

AT

FORT PECK DAM

How Problems of Procurement, Placement, Training, Management and Living Conditions of Personnel On Large, Isolated Government Project Are Handled

SANDWICHES are prepared on wholesale scale for workers' lunches. During peak of construction the dam builders consumed 13,000 sandwiches daily.

By H. BROOKS

Chief Administrative Assistant

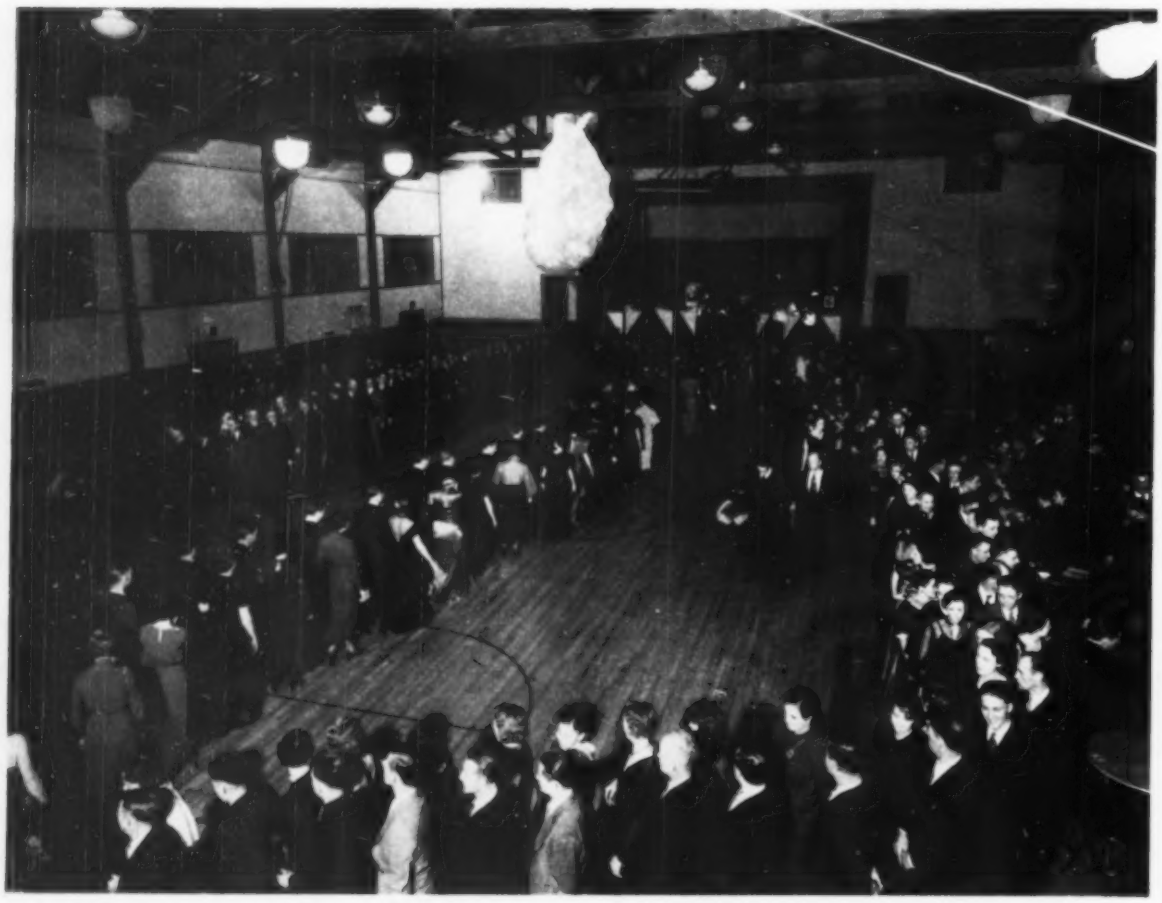
U. S. Engineer Office,

Fort Peck, Mont.

ONE OF THE MOST IMPORTANT FEATURES of the construction of large projects is the procurement, placement, training and management of the required personnel. In the construction of the Fort Peck dam, on the Missouri River in Montana, by the U. S. Army Engineers this feature has been unusually interesting, due to the distance of the project from large centers of population and to the variety of work involved.

A general idea of the many different classes of employees required is apparent from a consideration of the major features of the project. The preliminary work involved the procurement of land for the damsite and reservoir, the construction of a complete town, a railroad, several miles of trestle work, bridges across the Milk and the Missouri Rivers, more than $4,000,000 worth of floating plant, 17¾ mi. of natural gas line, 288 mi. of 154,000-v. power transmission line and many miles of power distribution line. The permanent work consisted of placing more than 100,000,000 cu. yd. of fill hydraulically, placing 1,200,000 cu. yd. of stone, and 4,000,000 cu. yd. of gravel in the toes and on the slopes of the dam, constructing approximately 4 mi. of tunnels, driving a steel piling core wall along the center line of the dam and constructing a large spillway.

Limited space permits only a general discussion of the methods of employment and employee relations on this job. Details of the requirements under special legislation and regulations and all reference to contractors' employees have been omitted.



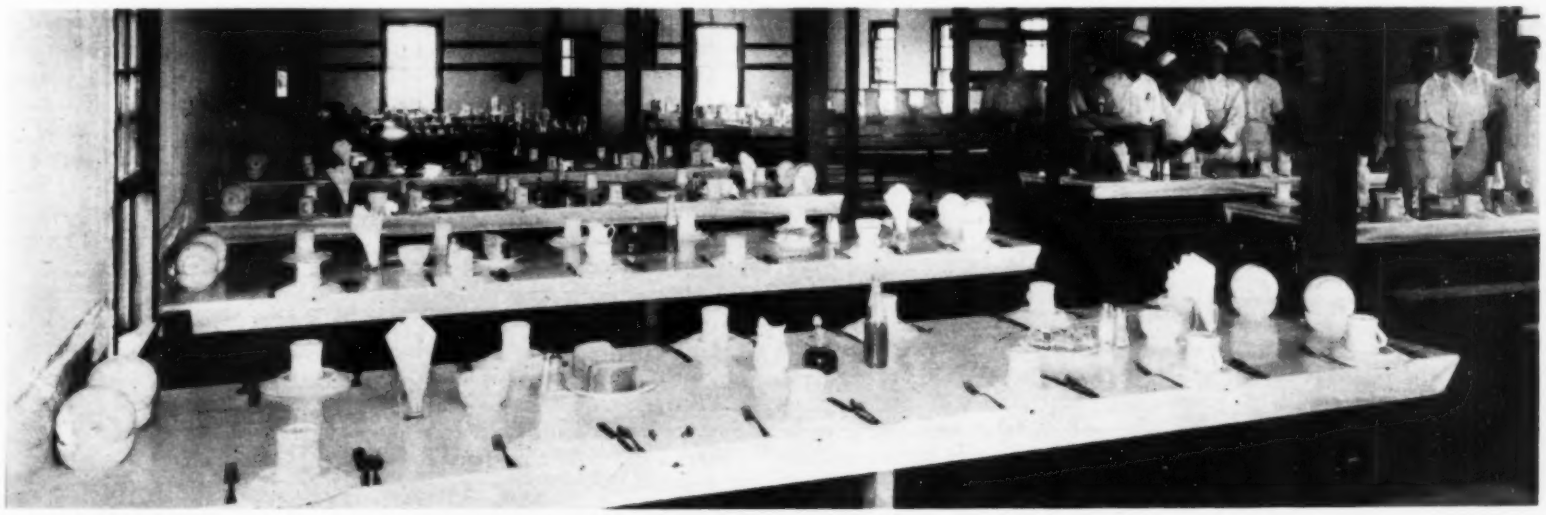
FORT PECK "JITTERBUGS" and specialists in the shag, fox trot and Lambeth Walk have their innings during dance in Recreation Hall where swing band gets into action.

Employment in Four Groups

From a careful study of the requirements of each feature of the project, a schedule of probable employments was prepared and further efforts were made to classify properly and prepare job specifications for the many different types of positions.

FOR KEY EMPLOYEES (left) on Fort Peck project 298 houses of this type have been constructed. This home won first prize in the 1938 Lawn and Garden contest.

ENTERTAINMENT for construction personnel and their families is provided in a motion picture theatre with a seating capacity of 1,209. The theatre is operated by the Fort Peck Recreation Association.



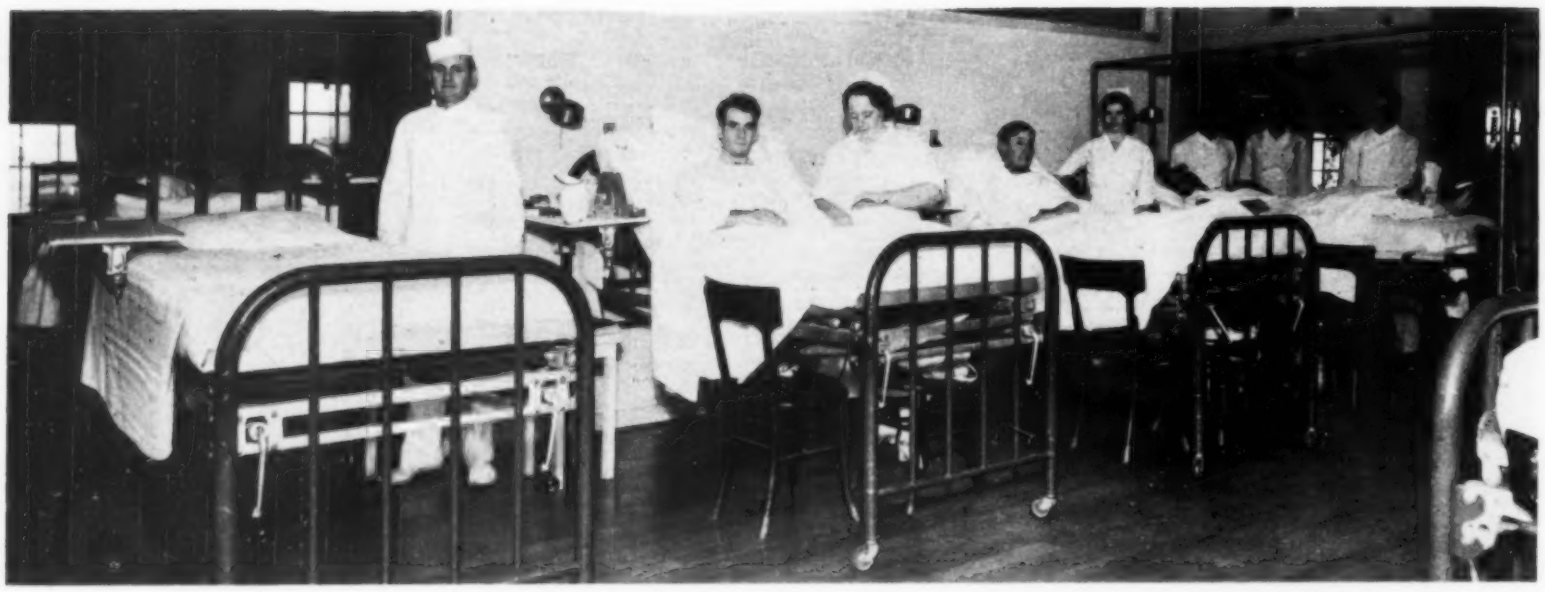
MESS HALL serves food of excellent quality and ample quantity to dam builders. There are no restrictions on number of meals an employee may eat after coming off shift.

These positions were divided into four groups: one, including engineers, draftsmen, architects, doctors, nurses, teachers, etc., had to be filled from registers maintained by the Civil Service Commission's central office in Washington, D. C.; a second, comprising clerical positions, had to be filled from registers maintained by the district manager of the Civil Service Commission located in Seattle, Wash.; a third group, made up of common laborers, cooks, waiters and similar unskilled positions, had to be filled through the National Reemployment Service; and a fourth group, containing inspectors, surveymen, railroad conductors, engineers, brakemen, switchmen, foremen, janitors, firemen and positions in the skilled and semi-skilled trades, had to be filled from registers established and maintained by the Local Civil Service Board set up in the Engineer District Office and operated with Engineer Department personnel.

Common labor was obtained largely through the National Reemployment Service, which opened an office in Glasgow, Mont., for the purpose of providing labor for the project. Except in coordinating the arrival of labor with the needs of the service, very little difficulty was experienced in the employment of this class of personnel. The National Reemployment Service also supplied a large number of skilled and semi-skilled employees when they were not required to be taken from Civil Service registers.

When the Civil Service Commission and its district manager had appropriate registers for the positions in the first and second groups mentioned

ONE OF THE KITCHENS that serve groups of barracks housing employees without families.



MEDICAL CARE is provided for all sick or injured workers. Here is a portion of the ward in the Fort Peck Hospital, staffed by one surgeon, two physicians, dentist, nurses and technicians.

above, little difficulty was experienced in getting suitable employees for these positions. In many cases, however, suitable eligibles could not be obtained in this manner, and it was then necessary to contact various organizations which had performed work of a similar nature and obtain the names and addresses of persons whom they recommended for the position to be filled, write these persons and procure all the data possible regarding their education, experience and other qualifications, and select for employment those best qualified to perform the required duties.

Applications for Jobs

The Local Civil Service Board, which handles registers for the positions mentioned in the fourth group, was organized soon after the Engineer Office was established on Dec. 1, 1933. This board is the key to efficient employments in most of the positions in an Engineer District above the grade of unskilled labor. It announces open competitive examinations based on probable requirements and on approved job specifications. When applications are received they are reviewed to determine whether the applicant has shown sufficient experience to meet the minimum requirements of the position, and whether all material questions have been answered. If the applicant does not show the required experience, his application is cancelled immediately. If sufficient experience is shown, confidential vouchers are mailed to his references and to former employers, particularly those for whom he has rendered service in positions similar to that for which he is applying. The applicant is rated on the length of corroborated experience. Particular attention is given to unfavorable and to unusually favorable vouchers. No consideration at all can be given to the applicant's political or religious affiliations.

The rated applications are then forwarded to the manager of the Eleventh Civil Service District who reviews, makes such corrections as he considers necessary and approves the ratings. When returned to the Local Board, a register of eligibles is established from which future appointments to that particular position must be made. Temporary appointees who have been serving pending the establishment of the Civil Service register, and who did not qualify for appointment on the examination, must be replaced by eligibles from the register. Approximately 20,000 applications have been rated by the Local Board in the Fort Peck Engineer Office.

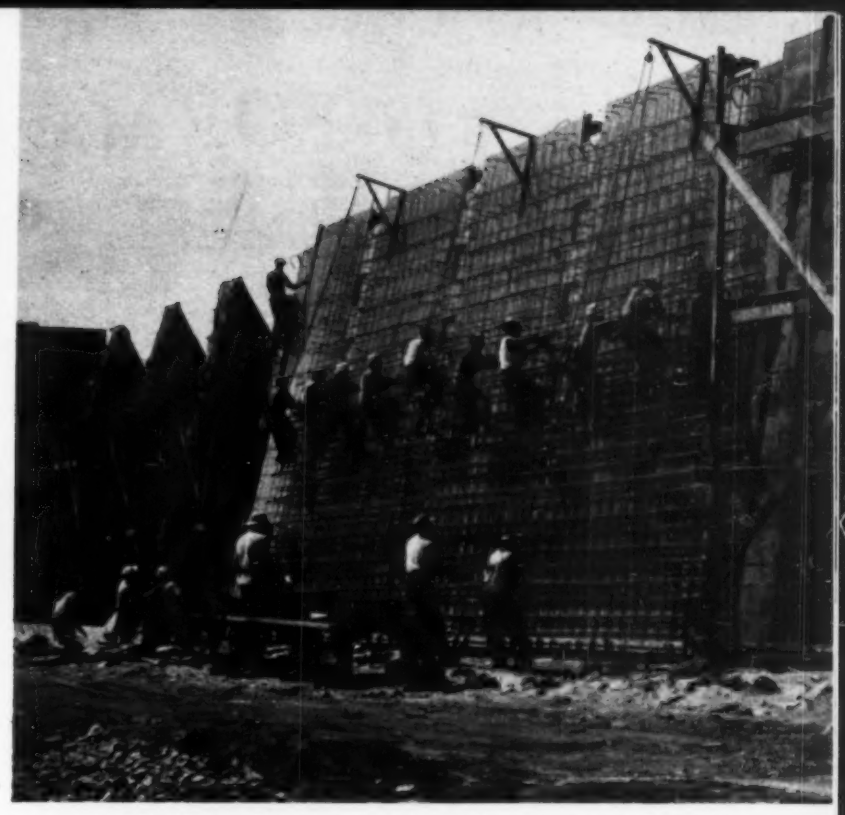
Employments under Civil Service rules are simple. When an appointing officer desires to fill a position subject to Civil Service rules, he requests a certificate of eligibles from the Civil Service Commission, the Civil Service District Manager, or the Local Civil Service Board, depending on which organization maintains the registers for that particular position. The certificate furnished contains the names and addresses of three applicants who have attained the highest ratings on the examination for that position. The examination papers of the eligibles are also furnished in order that the appointing officer can see the experience record, education, photograph and the kind of work done in each subject covered by a written examination.

Inquiries are mailed to the eligibles on the certificate. The inquiries give the salary, designation, place of employment, probable length of employment, information regarding sub-

(Continued on page 72)

BARRACKS of this type furnish living quarters for laborers without families on dam. There are 163 structures of this type.

KNIFING THEIR WAY through leathery clay 35 ft. below street level, tunnel workers start digging Chicago subway by slicing long strips with two-man clay knives.

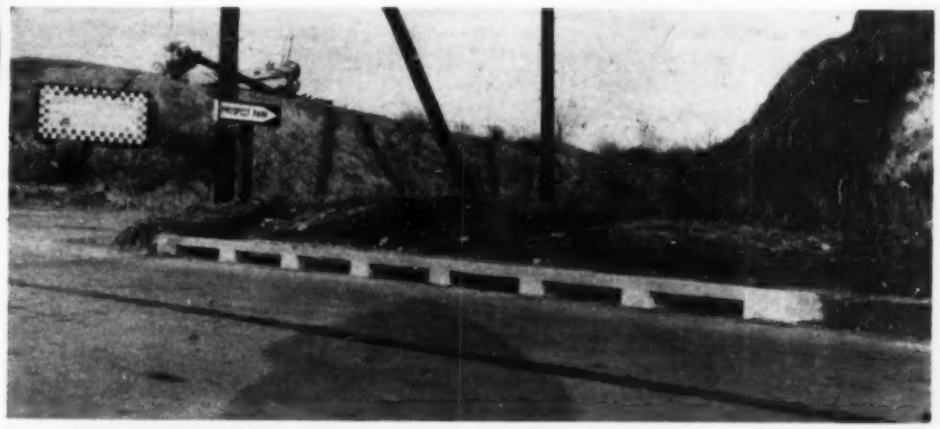


HUMAN FLIES scale face of retaining wall to tie steel reinforcement on Los Angeles River channel improvement project, being constructed by U. S. Army Engineers. View shows transition between vertical and inclined retaining walls on south bank of river near Verdugo Wash junction.

JOB ODDITIES

A MONTHLY PAGE OF

Unusual Features of Construction



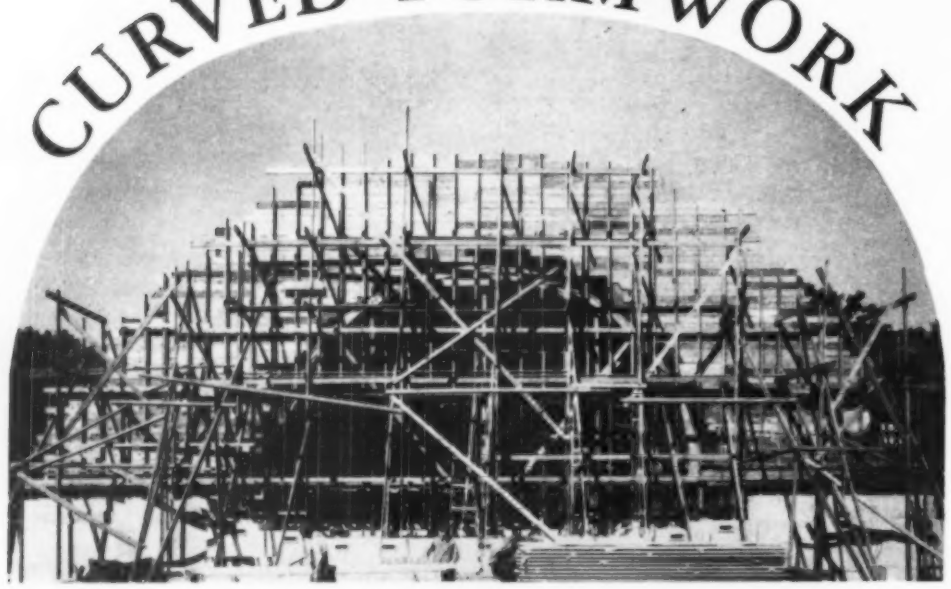
CURB SCUPPERS designed by Illinois Division of Highways permit water to drain from pavement into open concrete flume at French Village, Ill., preventing flooding of properties farther down hill. Paving and cutting of Mississippi River bluffs at top of hill divert more water than formerly into lands at foot of bluffs. — Photo from H. B. SENNOTT, district construction engineer, Illinois Division of Highways, Edgemont Station, East St. Louis, Ill.

LOW COST HOUSING (below) reaches new economy level in mountains near Minneapolis, N. C. (not Minn.), where Roby Hicks **(left)** reckons maybe the government would be pretty surprised to hear his three-room stone house cost only $27.50. Built by Roby "between times" with stones gathered on 52-acre farm and with wood salvaged from earlier buildings, biggest cash outlay was for fifteen bags of cement. Rest of money went for glass, nails and odds and ends which home-builder could not make from native material.

REQUIEM (below) for San Francisco ferries is pronounced by Alameda-Southern Pacific 7:30 Commuters' Club, performing final rites as bay ferry system ceases operation in favor of rapid transit rail service on San Francisco-Oakland Bay bridge. Six pallbearers carry model of ferry boat Sacramento and consign it to Davey Jones' locker in San Francisco Bay.

CURVED FORMWORK

Solves Problem of Building Concrete Shell for Bandstand



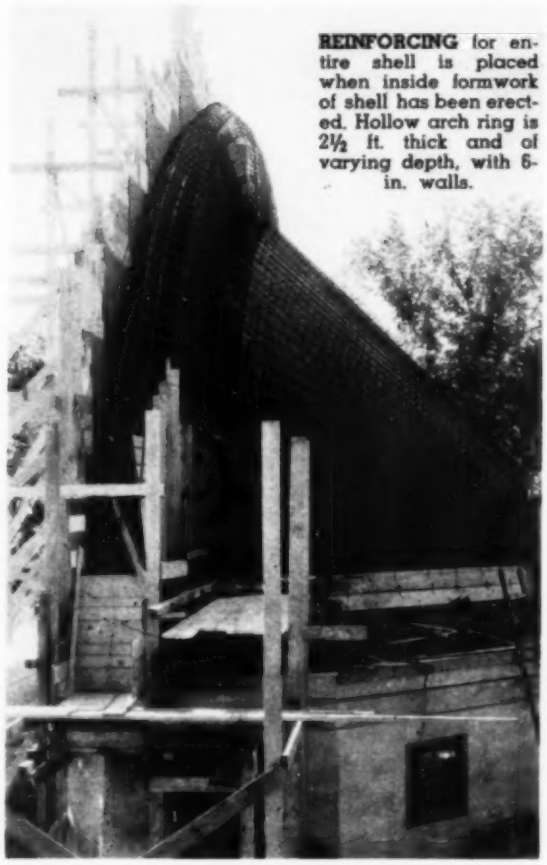
FORMWORK in place for concreting band shell proper. Rafters to carry inside form sheathing extend radially from arch ring to back wall, their ends being supported on circular ribbons made of segmental pieces of 1x6-in. attached to studs of back wall form and shores of arch ring soffit. Tongue-and-groove boards then are bent over the rafters and securely nailed. Plywood cut to proper shape may be used instead of boards for sheathing.

GROWING POPULARITY of community musical entertainment has led recently to construction of a large number of band shells. Many of the finest of these music pavilions have been built of reinforced concrete. The band shell illustrated was erected last summer at Fort Dodge, Iowa, and was designed by Henry L. Kamphoefner, assistant professor of architecture, University of Oklahoma. He has designed similar music pavilions including the one in Grandview Park, Sioux City, Iowa.

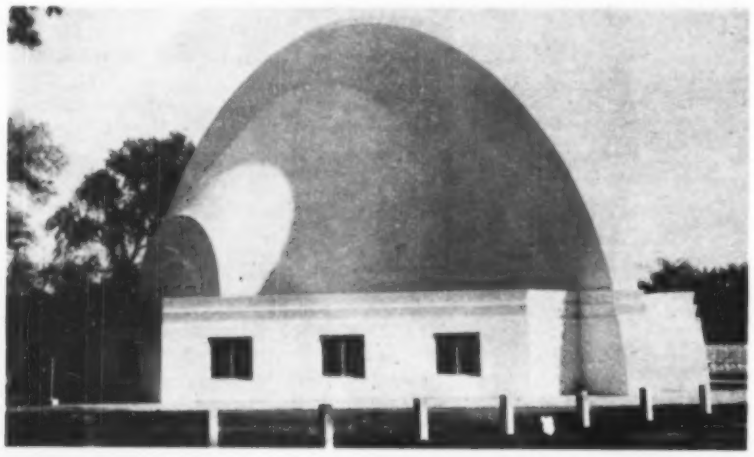
Buell & Winter, Sioux City, were the engineers on the Fort Dodge band shell,erected by the city in Oleson Park at a cost of approximately $46,000.

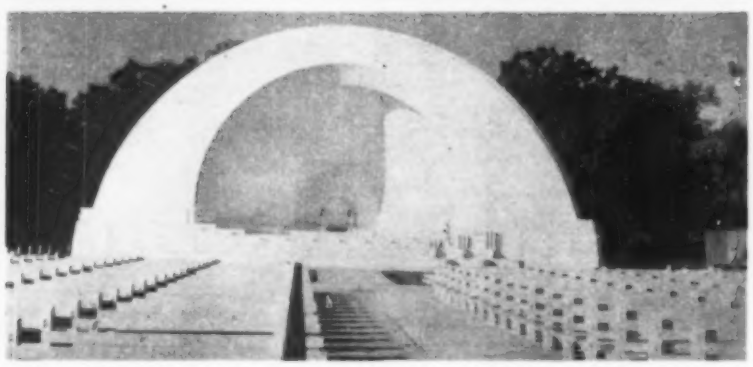
The Fort Dodge shell, like others of its kind, involves formwork not met with in ordinary wall construction. Band shells usually consist of an arch ring at the front of the cone, a vertical back wall that cuts the cone off near its apex, and the shell itself. Most of the formwork, therefore, consists of curved and tapered elements.

The photographs show the major steps in band shell construction.



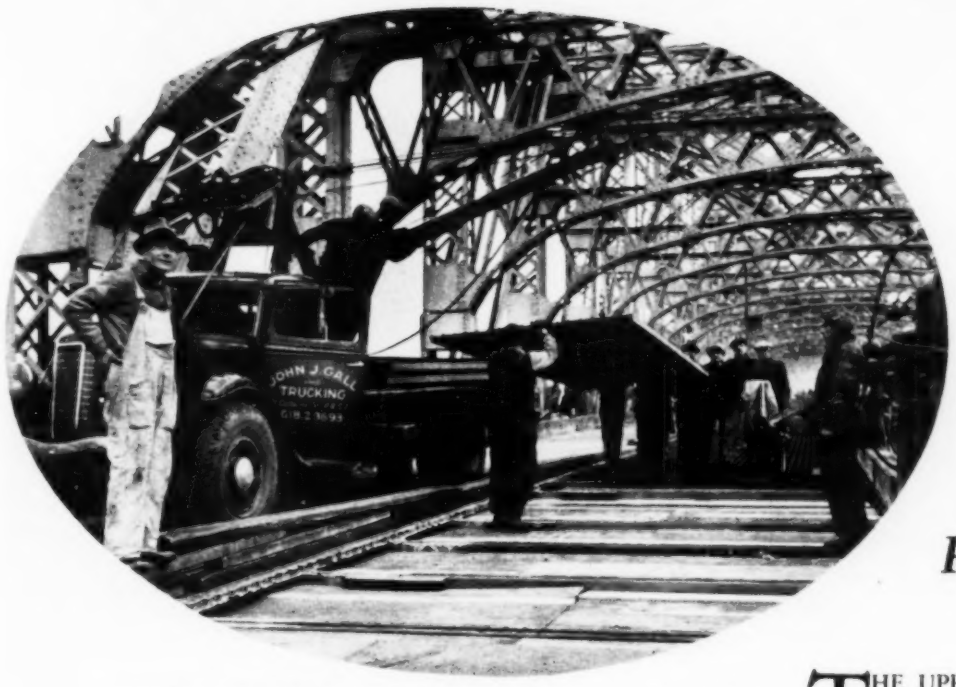
REINFORCING for entire shell is placed when inside formwork of shell has been erected. Hollow arch ring is 2½ ft. thick and of varying depth, with 6-in. walls.





COMPLETED BAND SHELL, from front and rear. Permanent seats, with precast concrete supports, accommodate audiences as large as 5,000.

WITH REINFORCING IN PLACE, outside form of shell up to springing line of cone and back wall form are erected, sheathing first having been oiled. Concrete is then placed up to springing line, but none should be placed until top form panels for cone and back of arch ring have been fabricated so that they may be put in place as the concreting advances.



REINFORCING MAT, of 2½-in. steel I-beam grid type, is lowered to place on roadway forms by crane boom on motor truck.

BRIDGE ROADWAY

Paved With Concrete Slabs Cast in Place and Reinforced With Steel Grids

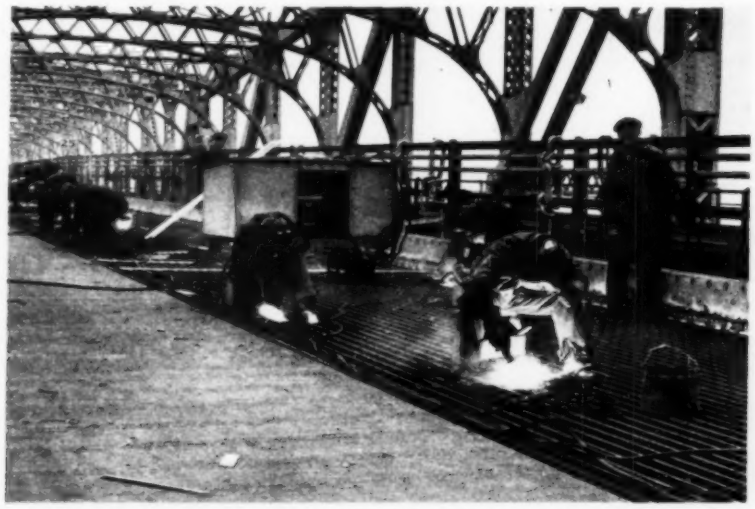
THE UPPER ROADWAY of the Queensboro bridge across the East River, New York City, newly repaved with non-skid pavement by the Works Progress Administration, was reopened for traffic Dec. 19, 1938, after having been closed since Oct. 3 to permit the repaving of the main spans. The job was planned originally for completion on April 30, 1939, and was finished in 5½ months as compared with the 10 months of the original estimate. The final cost was $461,000, as compared with an original estimate of $673,500.

The cost per square foot on the approaches was the same as the estimate — 63c. per square foot. On the main spans, however, the actual cost figured $2.72 a square foot as compared with the estimate of $4.25 per square foot, a saving of $1.53 per square foot. A difference in the methods employed by the WPA on the Queensboro bridge and by the contractors on the Manhattan bridge (see January issue, p. 32) was that the former poured the concrete on the job while the latter prefabricated the grid reinforcement and concrete into slabs and replaced the old pavement with these at night, making possible the continual daytime use of the bridge.

The Works Progress Administration completed the repaving of the lower level of the Queensboro bridge (see issues of August, 1936, p. 28 and March, 1937, p. 50) on June 11, 1938, at a cost of $1,028,000, slightly over 1 per cent in excess of the estimates. The cost on the main span was $3.33 per square foot. This main highway of the heavily traveled bridge—its 100,000 vehicles per day are said to make it the heaviest-traveled bridge in the world—was repaved with a minimum of interference with traffic.

The Y-shaped upper roadway extends from a point on East 57th St. near Second Ave., Manhattan, to two

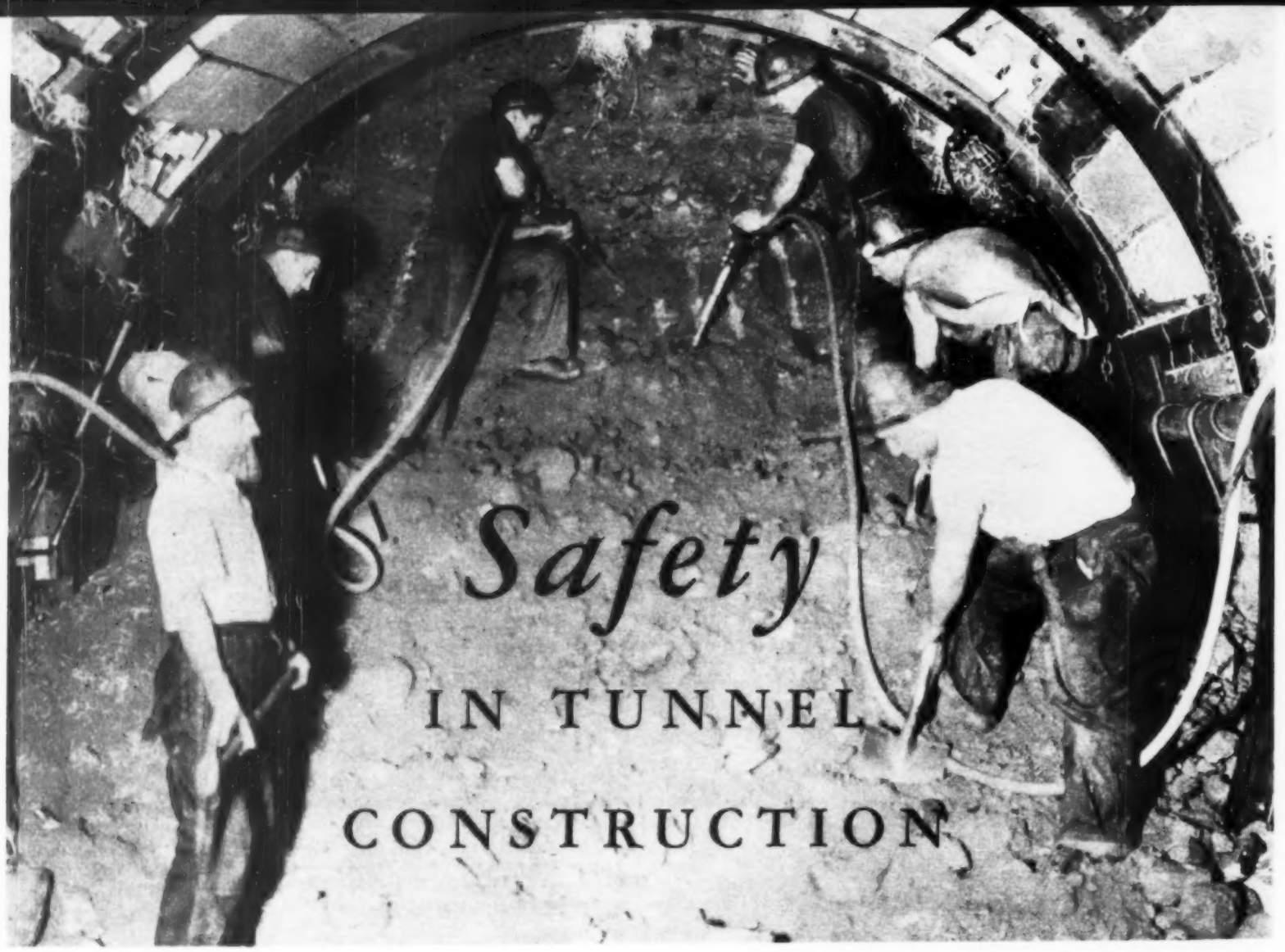
(*Continued on page* 66)



ELECTRIC WELDING in connection with placing and anchoring new reinforced roadway to existing bridge structure totaled 37,600 lin. ft.

CONCRETE for bridge roadway is poured on steel I-beam reinforcing mats and screeded and vibrated to smooth finish

WOOD SCAFFOLD 15 ft. wide was hung beneath upper bridge roadway to provide working platform for form setting and to protect vehicles passing along lower roadway.



Safety IN TUNNEL CONSTRUCTION

Photos by courtesy of
METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

HARD HATS protect heads of tunnel workers from injury by objects falling from above.

A PAPER (SLIGHTLY CONDENSED) PRESENTED BEFORE THE CONSTRUCTION SECTION OF THE NATIONAL SAFETY COUNCIL'S ANNUAL CONGRESS

By A. D. HUBBARD

District Supervising Engineer,
Employers Mutual Liability Insurance Co.
Chicago, Ill.

SAFETY IN TUNNEL CONSTRUCTION presents problems different from those of the average industrial plant or the average construction job on the earth's surface. The large labor turnover, which necessitates hiring of inexperienced workmen; the close and confined quarters in which men must work and handle material; the placing of concrete in high and humid temperatures; the ever-present hazard of gas seepage through the ground and nearby gas lines; the hazard of working under compressed air; the transportation and use of high explosives; and the problem of selling the old-time "sand-hog" on new safety ideas — all these make accident prevention in tunnels an ever-changing problem. One of the chief hazards in tunnel work is the congestion; every particle of excavated earth has to be transported to the tunnel shaft, and every bit of material used in the construction has to be transported from the same shaft to the tunnel face. Good housekeeping is an absolute necessity in tunnel construction.

We have written insurance on tunnel contracting operations in Chicago for approximately 30 mi. of tunnel varying from 4 to 22 ft. in diameter, and in Detroit for approximately 6 mi. varying from 12 to 20 ft. Two methods of construction, dictated by the nature of the ground through which the tunnels were dug, have been used. In one method, the earth was excavated with picks and shovels, airspades and clay knives. In some of the larger tunnels it was possible to use electrically powered excavating machines to do part of the digging and to load the earth into dump cars. In another operation, the tunneling was done by the shield method which, we feel, is more efficient and affords greater protection to the workmen than any other method.

The problem of selling new safety ideas on tunnel projects was not confined entirely to the old-time sand-hogs; we had to sell the contractor himself on installing suitable safety measures. Experience has taught us many lessons. On the basis of that experience we have developed a safety program which, if it is conscientiously followed, cannot help but control accident frequency and severity. We feel that we are now in a position to outline to a contractor a well planned, definite course of procedure for accident prevention. Contractors are beginning to realize the importance of safety work and to give us their complete cooperation, because they know that we have a common interest in accident prevention.

Common Causes of Accidents

An analysis of previous accidents which had occurred in tunnel construction clearly showed that falling objects, cement burns and infections were the chief causes of accidents. Preventive measures have decreased these types of injuries, although they are still the predominating kinds. During a 15-month period in a recently completed 18-ft. sewer tunnel only two minor lost-time injuries resulted from cement burns and there was not a single serious eye injury from splashing concrete. Protective apparel and preventives made this record possible. The men who puddled concrete or worked in close quarters behind the form carrier were given hip-length, safety-toe rubber boots, slicker pants, coats and rubber gloves. The cement finishers were given rubber knee-pads to prevent knee burns, and all concrete workers were instructed to rub exposed parts with vaseline, wear proper underwear and take baths when coming off

SAFETY-TOE SHOES and hard hats prevented foot and head injuries on Detroit sewer tunnel job.

IN WELDING WORK helmets and gloves should be required to safeguard operator.

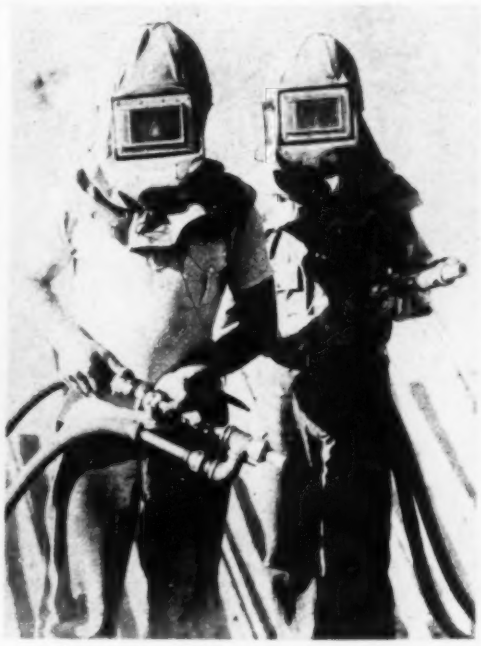
shifts. Spectacle type goggles were furnished to all men exposed to splashing concrete. *If a burn did occur, it was promptly washed with a diluted vinegar solution to neutralize the alkali.*

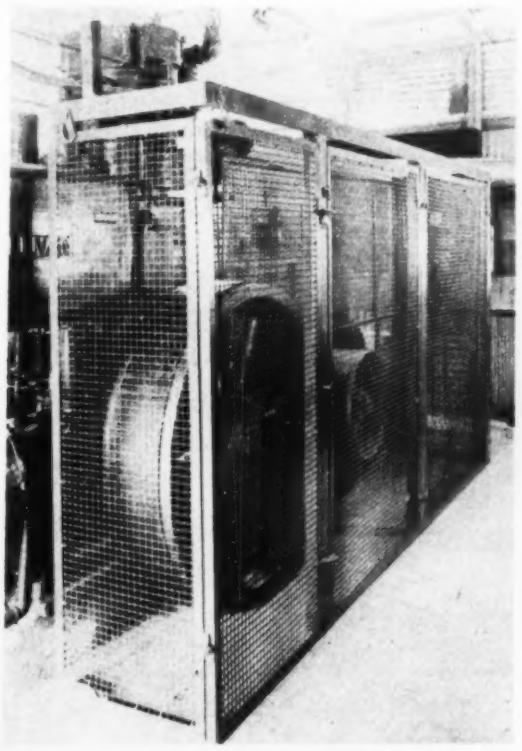
A great aid in preventing injuries from falling objects was the use of hard hats and safety-toe shoes or boots. Introducing this protective apparel was one of the most difficult jobs we had, because it was a new idea in this territory or perhaps because the tunnel workers felt that their heads were too hard to be affected by falling 2x4's, sledge hammers or wood blocks. After persistent effort, however, we induced a foreman to equip his shift of men with safety hats and shoes, and gradually the prejudices were overcome. Now, if you visit any of the tunnel construction operations in which we are interested, you will find a rule which states: "No employee is permitted in this tunnel without safety hat and safety-toe shoes or safety boots." This ruling applies not only to men doing mining, mucking and concrete work, but to electricians, pipe-fitters or executives of the concern. I believe that in our own operations at least 200 skull fractures have been prevented by the hard hats and an equal number of broken feet have been prevented by the safety-toe shoes or boots.

Because tunnel shafts are usually located some distance from immediate medical services or a doctor's office, a major requirement is proper first-aid equipment. On our tunnel jobs doctors have been in constant attendance or third-year medical students have been employed under the supervision of a competent doctor. Stretchers and first-aid cabinets are located at the scene of operations if a group of men are working some distance from the first-aid station, and the superintendents and foremen are constantly reminded never to allow the men to neglect a cut or scratch, regardless of

GOGGLES should be worn to eliminate eye injuries during grinding operations.

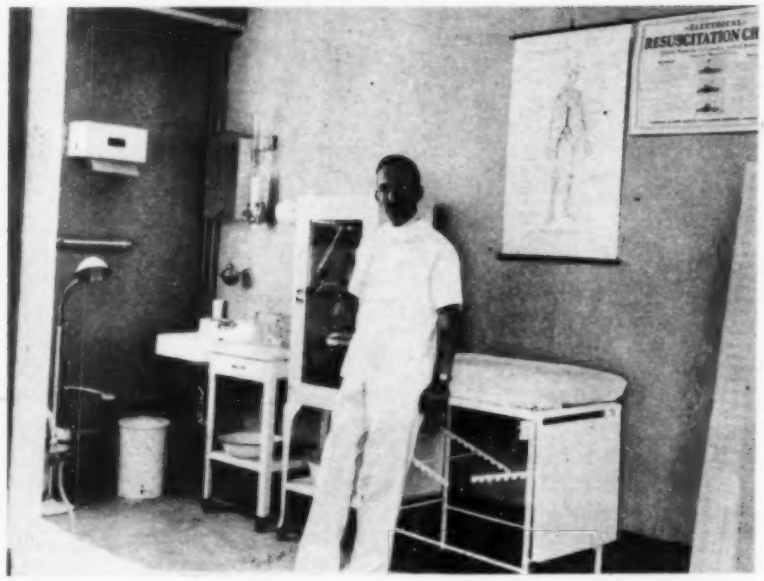
HELMETS (below) protect workers operating sand-blasting equipment.





GUARDS should be installed around moving parts of contractor's mechanical equipment.

BOX used in handling explosives underground carries "Danger" warning sign.



FIRST AID FACILITIES for injured tunnel workers are effective in preventing loss of life.

how trivial it may seem. Proper and immediate care of small injuries make infections scarce.

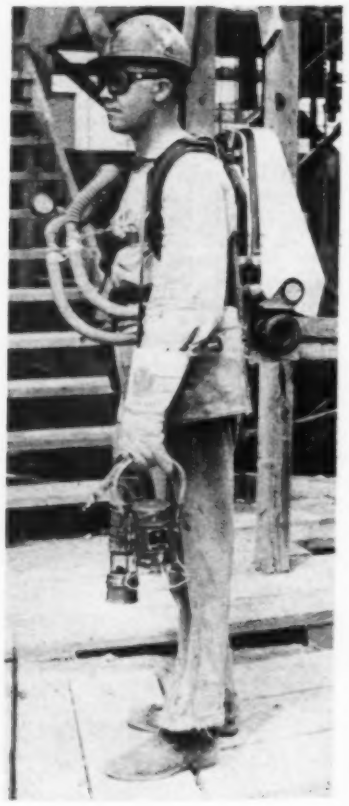
Compressed Air Precautions

The nature of the work makes it essential that each man be given a thorough physical examination to determine his fitness for the work. Usually employees can be given work which will not interfere with physical disabilities or productiveness and still not tend to cause further injury. Compressed-air workers must have a physical examination at regular intervals. Working hours, compression and decompression are regulated according to state laws and, of course, depend upon the air pressure carried. Physical unfitness, over-exposure and too rapid decompression are the chief causes of "bends" or caisson disease. A warm change-house and hot coffee for men coming off shifts are first aid in prevention of bends. Every job which requires 15 lb. or more pressure must be provided with a fully equipped, heated, medical lock. To prevent blocked ears, employees must keep ears clean from wax and dirt and avoid head colds. Employees are instructed not to enter locks if they are suffering from head colds and they are urged to wear woolen underwear and a heavy coat to help prevent colds often caused by the sudden drop in temperature while decompression is taking place.

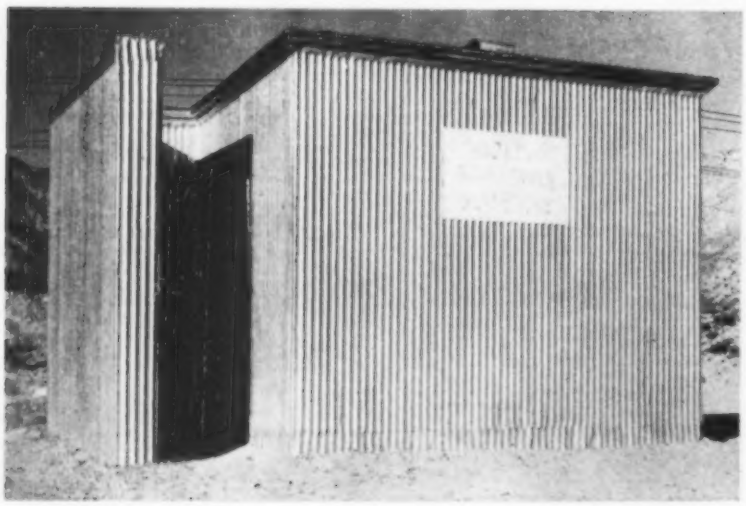
On rock jobs, lung hazards can be

(Continued on page 80)

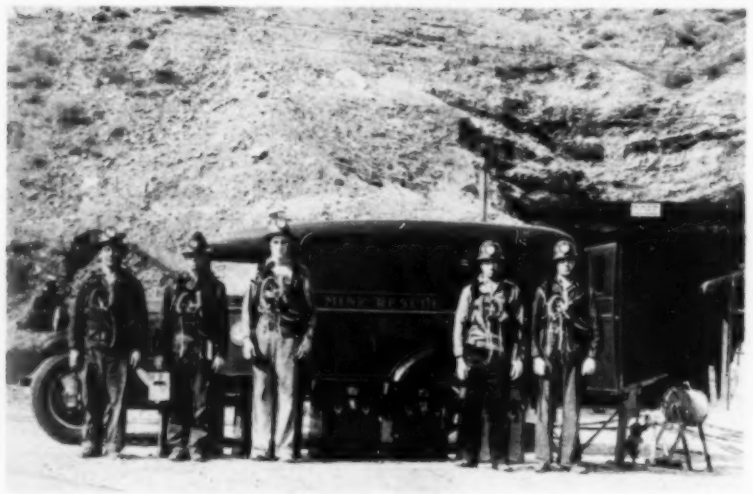
PROTECTION FOR CONCRETE WORKER (right), subject to eye and skin burns from splashed cement, includes safety-toe rubber boots, spectacle goggles, slicker coat, rubber gloves and safety hat.



COMPLETELY OUTFITTED (left), to perform rescue work in mine or tunnel. Equipment includes two-hour oxygen breathing apparatus, hydrogen sulphide detector, combustible gas indicator, flame safety lamp, safety hat and safety-toe shoes.



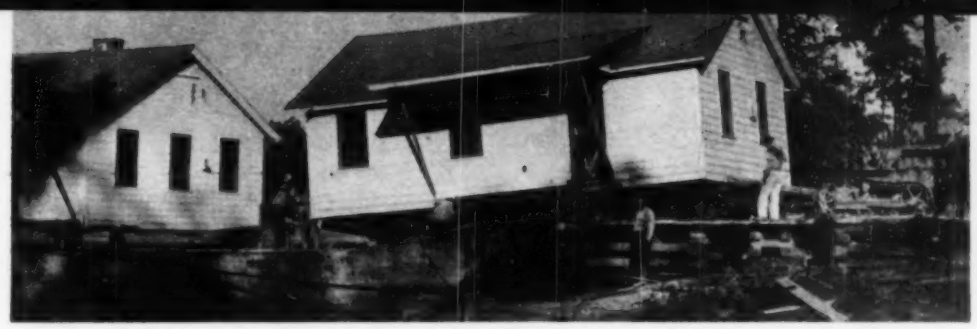
SPECIAL MAGAZINES insure safe storage of explosives for tunneling.



RESCUE SQUAD, thoroughly trained and equipped, can save lives in tunnel accidents.

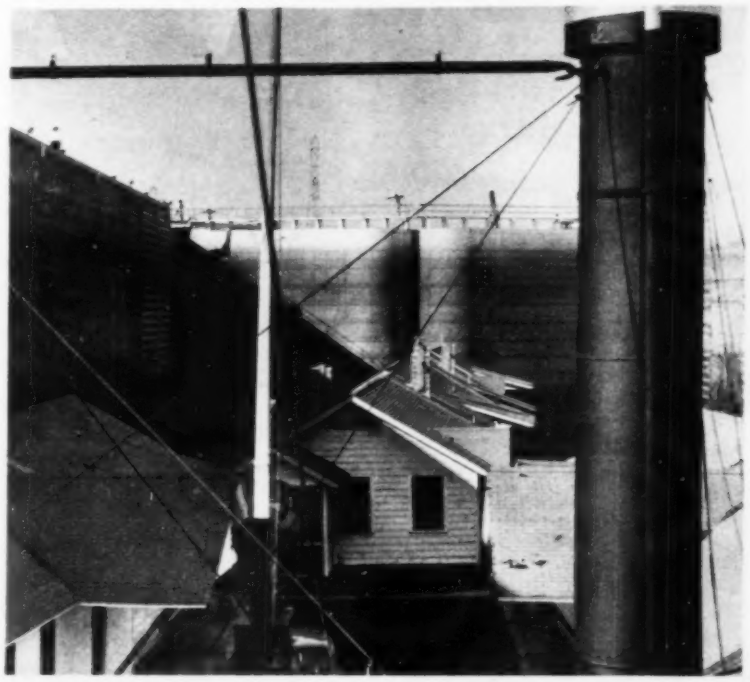
Moving Day At T. V. A.

As Work at Pickwick Landing Dam Ends Houses for Construction Workers are Transferred to Site of Gilbertsville Dam



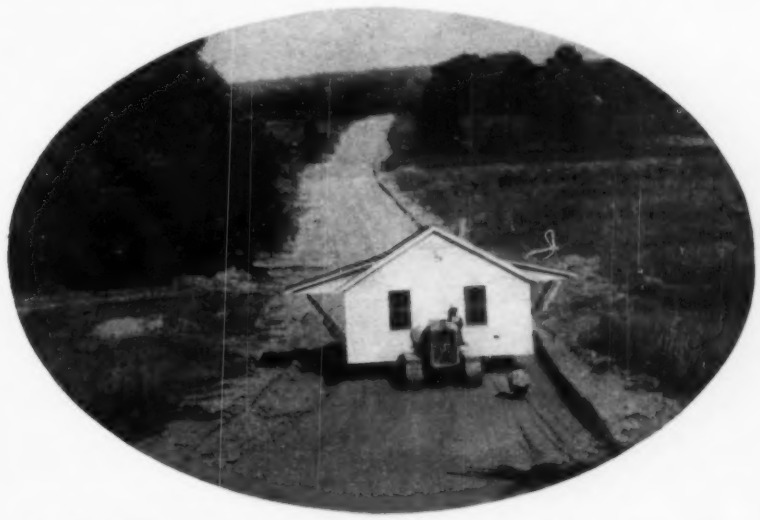
1 **HOUSES** which TVA workers occupied at Pickwick Landing dam in Tennessee are placed on barges preparatory to being towed to site of Gilbertsville dam in Alabama.

2 **THE TOW** of house-laden barges starts on its journey up the Tennessee River.



3 **THROUGH LOCK** at Pickwick Landing dam the houses are safely passed. Photo was taken from pilot house of towboat "Hiwassee"

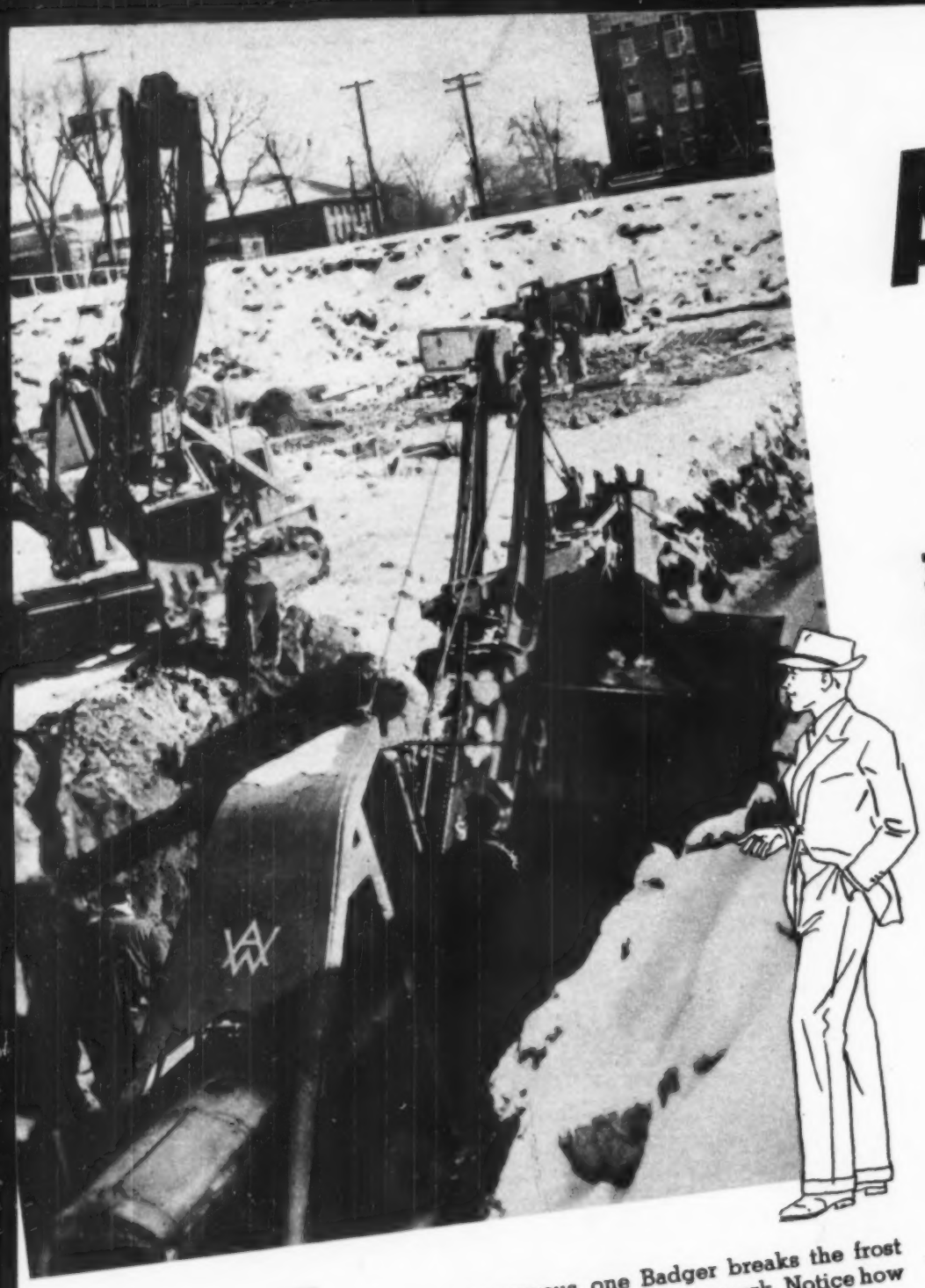
4 **UNLOADING** of houses from barges is accomplished near Gilbertsville dam site.



5 **JOURNEY** over land is continued as tractor hauls house on trailer to village site.

6 **AT NEW VILLAGE SITE** old house, after trip by water and land, is erected on new foundations.

7 **FINAL STAGE (below)** of house moving operation is reached when wood structures are set up to form new village at Gilbertsville dam.



ANY WAY *You*

IT'S WORK OUTPUT THAT MAKES SHOVEL PROFIT . . .

And here's why the A-W ½-yard Badger provides greater work output every minute, every working day than a full revolving shovel of the same rating. It digs harder material faster! 30,000 pounds pull at the dipper lip with ample counterweight gives it the power to rip through clay or cemented gravel. Yet none of the counterweight has to swing when discharging. Only the boom, dipper and dipper stick turn. This means faster starting . . . faster stopping . . . a big yardage dividend every day.

On the University of Minnesota campus, one Badger breaks the frost bound surface while a second handles the excavating work. Notice how the freedom from tail swing enables the Badger to work in close quarters.

Every two minutes a truck pulled out fully loaded. The Badger with a half yard clamshell unloaded 7 carloads of gravel per eight hour day for a construction project near Starkville, Miss.

"I formerly had a ¾ yard shovel," writes Mr. Wm. J. Gilgenbach, "and can say our Badger can out-perform it." The Badger is handling limestone in Wilson, Wisconsin.

AUSTIN-WESTERN

LOOK AT IT

In terms of capacity, the Badger is cheaper to buy . . . cheaper to operate . . . cheaper to maintain. It will pay out when the margin of profit is small, where the job is tough. On an amazing number of big jobs, its nimble, speedy action has outclassed much larger equipment in yardage moved and time saved.

Contributing to the unusual efficiency of the A-W Badger are (1) Its extra dumping height and reach, (2) Its easy convertability for use as a dragline, clamshell, crane, trench hoe or pile driver, (3) Its easy portability to new jobs at truck speed.

It will cost less to move more, if you handle your next job with a Badger. Ask us to prove it.

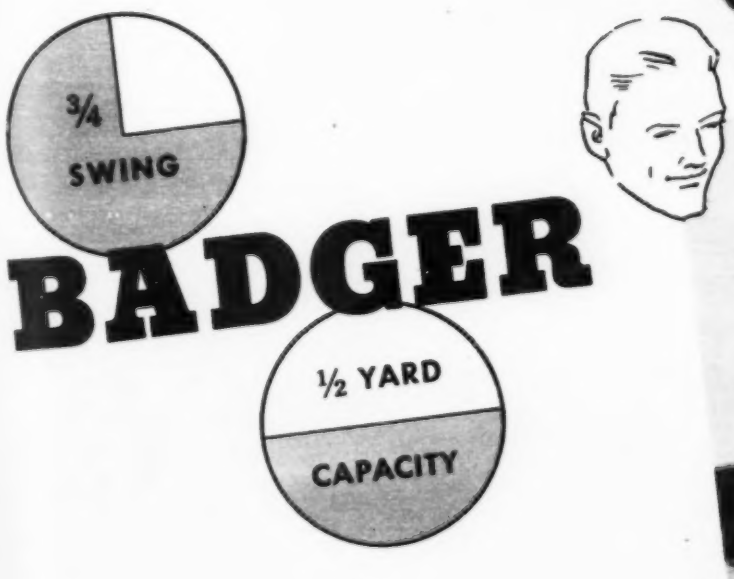
THE AUSTIN-WESTERN ROAD MACHINERY COMPANY
AURORA, ILLINOIS

A curved boom gives the Badger exceptional dumping height for this job at Springfield, Ohio. 40,000 yards of overburden were removed for the Moores Lime Company.

In Sweetwater County, Wyoming, the Badger handled 400 feet of piling in an eight hour shift under difficult winter operating conditions.

The City of Helena, Montana digs sewer excavation with the Badger trench hoe. This cemented gravel is typical of the soil in this area. Helena also has a regular shovel attachment for Badger operation in the municipal pit.

Mr. Frank Curren, city engineer of Butte, writes: "I am able to find profitable work for it every day. We have yet to find a place where the full swing feature would be an advantage and on many jobs a full swing shovel would have been considerably bothered."

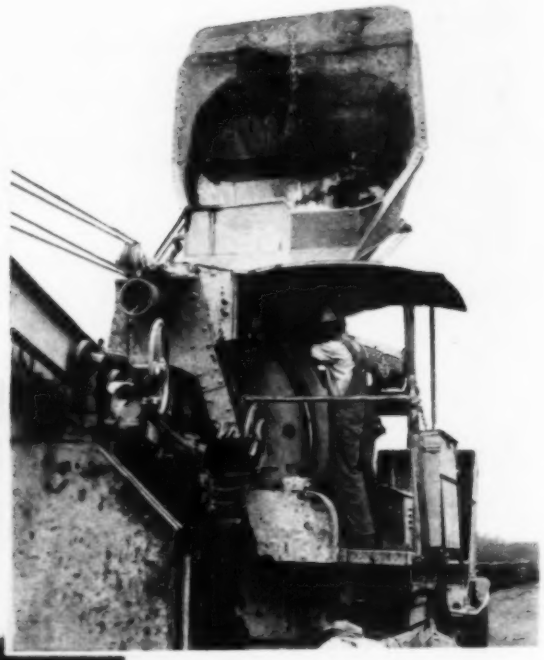


How They Did It

CONSTRUCTION DETAILS

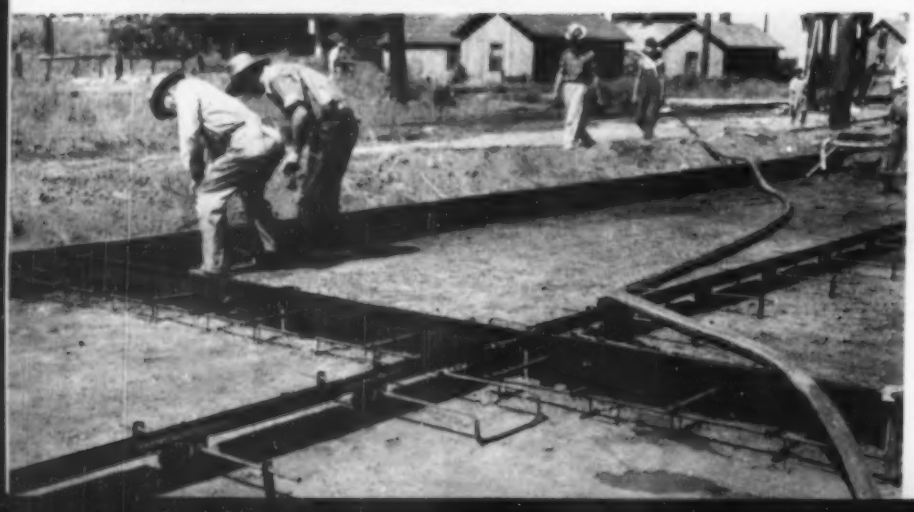
For Superintendents and Foremen

BULK AGGREGATE BINS elevated 10 ft. above former position and equipped with Blaw-Knox weighing batchers provide serviceable batching set-up for Blaw-Knox truck mixers operated by Kirkpatrick Sand & Cement Co., Birmingham, Ala. Inclined elevator, delivering to two-way chutes in tubular framework above bins, unloads materials from hopper-bottom railroad cars. Truck mixers pick up cement from warehouse in separate operation.



KNOCKER built into skip of paving mixer swings on pin connection and strikes skip **(above, right)** when latter is raised, jarring pan and preventing material from sticking. — Photo from WILLIAM S. FOSTER, inspector, Iowa Highway Commission, Rockwell City, Iowa.

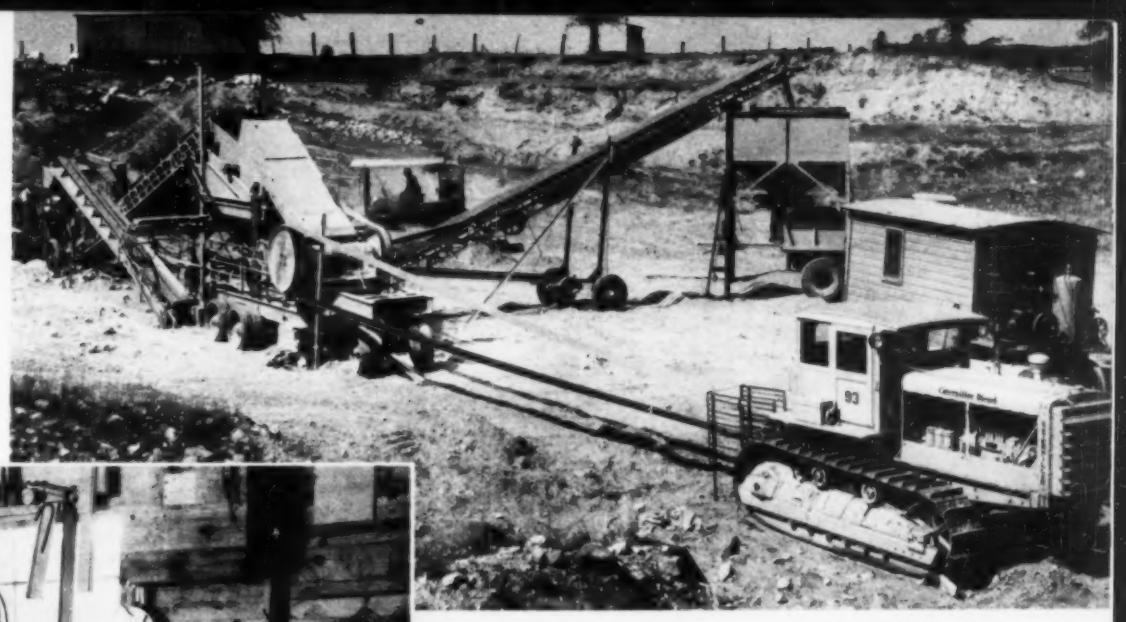
SAFE SPEED SIGNS (left) are placed at curves in test program of California's Division of Highways. New reflectorized markers indicate to motorists safe driving speed around curves and are designed to prevent driving-off-the-road and overturning accidents for which excessive speed is chief contributing factor.



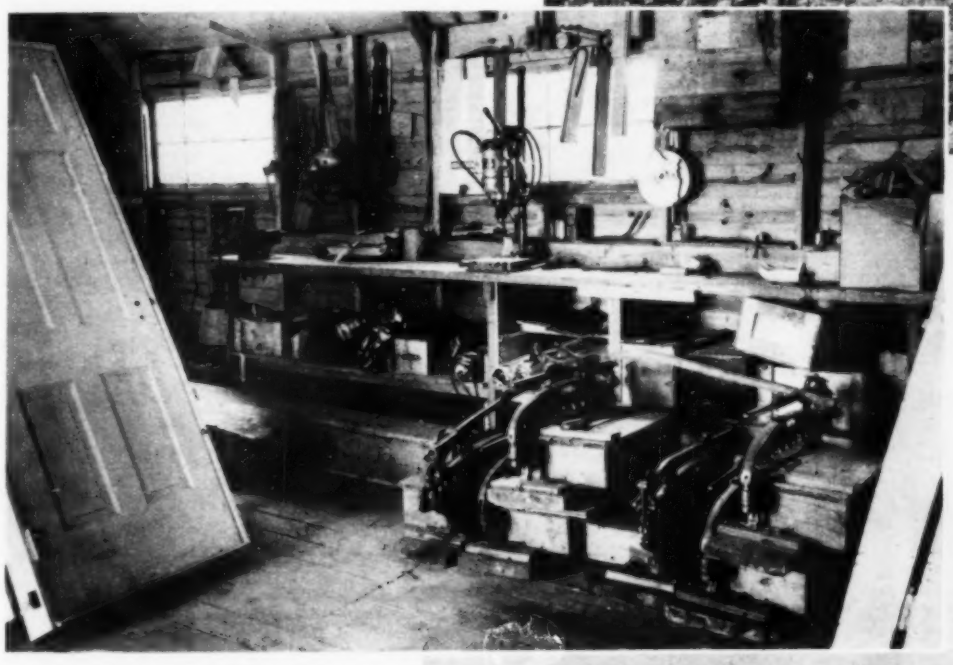
STAKES AND METAL CAP STRAPS (left) hold joint filler in position on concrete paving contract of Moore Bros., East St. Louis, Ill., for Illinois Division of Highways in French Village. Special chairs support dowel bars at transverse joint.

ICE NEVER STOPS discharge of water from Vermont highway subdrain of 6-in. corrugated perforated asphalt-coated pipe, left projecting perhaps 8 in. from headwall about 1 ft. above ground. By this construction, State Highway Department engineers prevent freezing of ice plug at pipe outlet.

95-HP. DIESEL TRACTOR (right) with belt pulley drives Universal 10 x 36-in. crusher producing gravel down to ⅞-in. size at average rate of 50 cu yd per hour for Waupaca County, Clintonville, Wis.

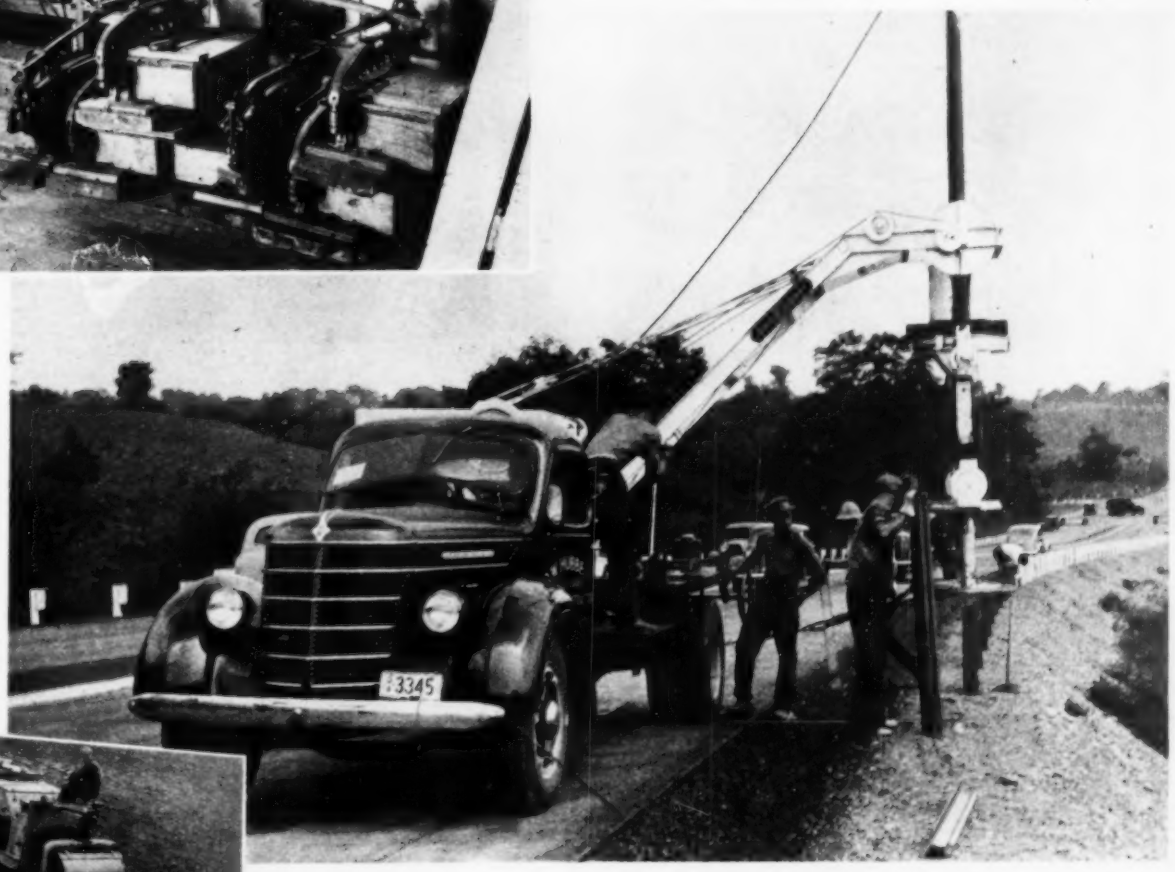


Caterpillar Tractor Co. photo



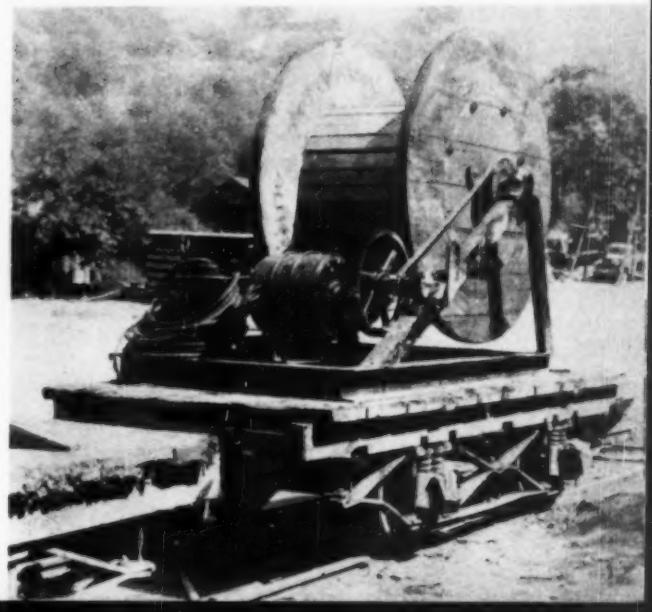
HOUSE CONSTRUCTION at Hilltop development, Silver Spring, Md., by Modern Housing of Washington, Inc., makes liberal use of efficient modern tools in fabricating shop and on structures. Mounted on or above work bench in shop are bench vise, mortising machine and ½-in. drill press. In bin under bench are ten electric power tools: five saws for field use, one sander, three drills and one router. On floor at right are six asbestos shingle cutters used by carpenters in facing exterior walls of all houses with shingles.

STEEL POSTS (below) for highway guard rail construction on Route 5 near Little Falls, N. Y. are driven to place by Hughes-Keenan ram rigged on boom mounted on International truck. Ball-bearing turntable allows ram to be swung through arc of 180 deg.



ASPHALT LINING in Eagle Mountain pumping plant reservoir of Metropolitan Water District's Colorado River aqueduct system in Southern California, is finished by two-wheel roller hauled up steep slope by cable from crawler crane at top of bank.

REEL WINDER (right), driven by d.c. motor supplied with power from storage battery locomotive which also provides transportation, facilitates removal of 40,000 ft. of three-conductor lead-clad cable from inside 10-ft. concrete-lined tunnel.—Photo from G. E. MILLER, West Construction Co., Monrovia, Calif.



"Area Maintenance" *Improves Secondary State Roads in Large Virginia County*

PATCHING OUTFIT on surface-treated secondary roads uses hand-operated pressure spray fed from small bituminous tank trailer, drawn by truck carrying coarse sand cover material.

MAINTENANCE LOT in each of five areas in county has group of portable buildings, made up of bolted sections, to house trucks, tools and supplies.

RESIDENT ENGINEER directing area maintenance organization during its first year's trial is W. W. NICHOLS, standing here on roadway in front of maintenance lot.

HEAVY BANK CUT on road improvement project is made by 40-hp. tractor and 10-ft. blade.

BLADE GRADER (below) drawn by tractor cuts side slope as part of roadway grading and widening for future surface treatment.

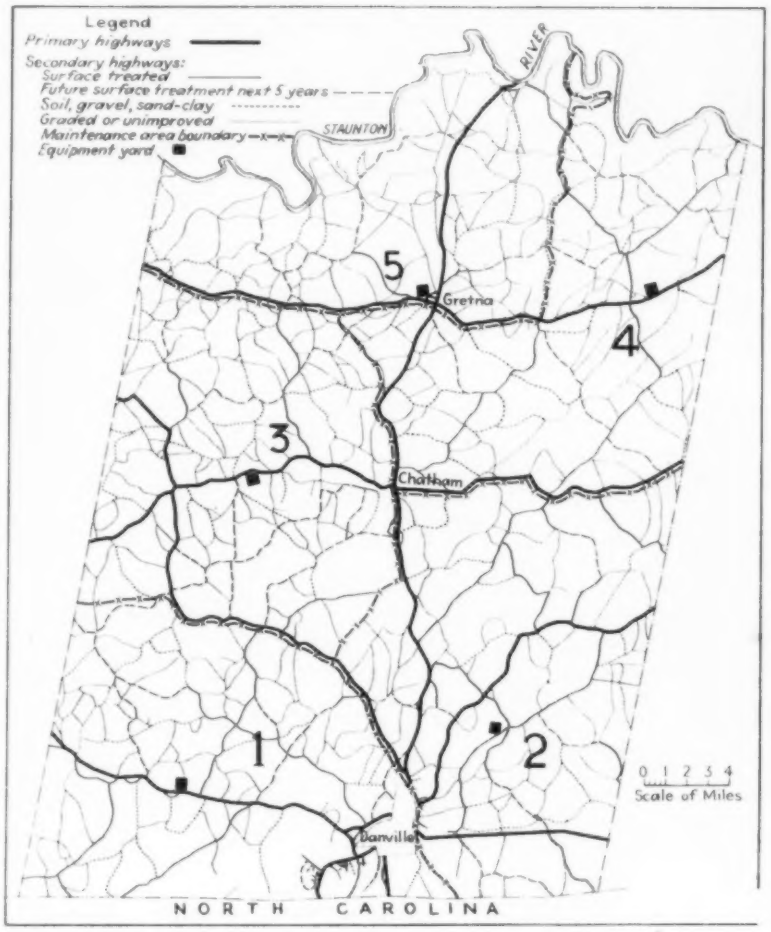
MOBILE WARNING SIGN (below). mounted on casters, indicates surface treatment in progress on a secondary road.

GENERAL IMPROVEMENT in the condition of the state's secondary roads in Pittsylvania County, Va., has resulted from substitution, at no increase in budget expense, of area methods of maintenance for the patrol organization in use until July 1, 1937. During its first year's trial, the area maintenance system won general approval of highway engineers, maintenance men and road users. Its successful application in Pittsylvania County portends probable adoption of the system in other large counties of the state.

Two Maintenance Systems — Until July, 1937, the 1,425 mi. of secondary state roads in the county were maintained by fifteen patrols individually responsible for an average of 95 mi. Each patrol employed a patrolman, one assistant and occasional day laborers, hired as required and authorized by the resident engineer. Equipment comprised one FWD 3-ton truck, one light grader and two small drags.

For construction work on secondary roads, the maintenance patrols were supplemented by three construction crews and one bridge crew. Each construction foreman had one tractor (75 or 60 hp.), one 12-ft. blade grader and one 1½-ton dump truck, with regular operators to run this equipment. Additional trucks were hired as needed.

Under the new plan, the county is divided into five areas having about 280 mi. of road in each area. Headquarters of the maintenance crews are centrally located, with equipment yards in five areas. The bridge crew remains a separate unit and works throughout the county. Reorganization on the new basis



PITTSYLVANIA COUNTY, Va., has secondary state road system of 1,425 mi. divided into five areas with centrally located equipment yards to facilitate maintenance and construction by large, well equipped crews, stationed one in each area.

BROOM DRAG distributes stone or sand covering on top of asphalt applied during bituminous surface treatment.

ROTARY BROOM and blower attachments on small tractor are used to clean dust and dirt from roadway surface before application of prime. Standing behind unit is K. R. GARBER, district surface treatment foreman.

caused no discharges or demotions of department employees, but it called for addition of some equipment.

A crew includes a foreman, two operators, three truck drivers and three helpers. Three of the crews have assistant foremen in addition to the foremen. Mechanical equipment comprises one tractor (40 to 75 hp.), one 12- or 10-ft. blade grader, two 7-ft. blade graders, three 1½-ton trucks, a ½-ton pick-up truck, and a 3-ton FWD truck which is optional, equipment rental for this last-named unit being charged only when the truck is used.

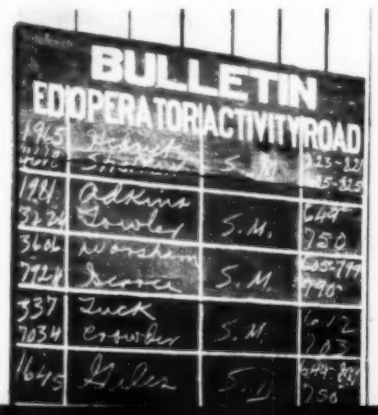
Results — Large area maintenance gangs equipped with tractor and trucks have achieved two important results. They have covered the roads in their areas with more speed and thoroughness than single patrols had been able to do on shorter mileages, and, in addition, they have moved material in sufficient volume actually to correct weaknesses and rebuild bad spots in existing roads, thus keeping the routes passable in all kinds of weather. As a further achievement, they have done a greater volume of grading in preparation for bituminous surface treatment, improving grade and alignment and widening the roadway section.

Another advantage of the simpli-

BROOM IN ACTION sweeps dust off compacted natural soil road.

MINERAL AGGREGATE (below) for surface treatment is loaded out of stockpile into truck by portable belt conveyor.

BULLETIN BOARD (below) at maintenance lot is filled in each morning to inform resident engineer or other visitors where they may find each unit of equipment. Board may also be used by anyone to leave notes of road conditions or items needing attention by road forces.



SMALL GRAVEL AND SAND from stockpile is scattered on top of prime coat by centrifugal spreader attached to rear end of dump truck.

OVERSIZE MATERIAL is rejected by 1-in. screen under discharge end of conveyor.

fied organization is more frequent contact between the resident engineer and the maintenance foremen. Under the old set-up, the resident engineer had the problem of supervising fifteen patrols, three construction outfits and one bridge crew on secondary roads, in addition to five patrols on the county's 182 mi. of primary highways — a total of 24 separate units. With consolidation of secondary road maintenance and construction into five areas, the number of units was reduced to eleven, and the resident engineer's supervisory effectiveness was correspondingly increased.

State Organization — For purposes of state-wide highway administration, Virginia is divided into eight districts and 57 residencies. Pittsylvania is the largest of 100 counties in the state. In common with other large counties, it is treated as a single residency.

In the entire state highway system are 9,300 mi. of primary roads and 38,000 mi. of secondary roads, the latter taken over from the counties in 1932. For the secondary mileage the state ordinarily has available each year about $6,000,000 for mainte-

(Continued on page 86)

HOUSE MOVING *Shifts Bridge to New Site*

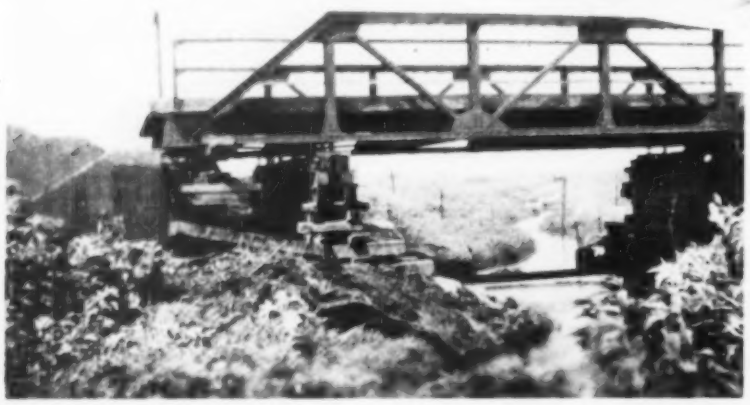
WHEN THE IOWA HIGHWAY COMMISSION declared unsuitable for primary traffic a bridge on Route 20 near Rockwell City, the structure was given to Calhoun County by the state on condition that the county shift it to a new site. The bridge is a 50-ft. pony truss, 20 ft. wide, weighing about 75 tons.

Standard house-moving equipment was used for the job, one four-wheel carriage being employed in front to facilitate steering, and two carriages at the rear. After the bridge was raised from its abutments and supported by cribbing, it was pulled from its site on to the road and hauled to a point where it was installed to replace one of the county's lighter structures. The moving operation, as illustrated in the accompanying photographs, was done under the supervision of W. E. McClure, engineer of Calhoun County, Ia.

Photos from

WILLIAM S. FOSTER

Inspector, Iowa Highway Commission, Creston, Ia.



RAISED FROM ABUTMENTS. bridge is supported by timber cribbing.

SUPPORTED ON FOUR-WHEEL CARRIAGES. steel truss has been pulled from site on to road.

FRONT END is supported by single carriage to facilitate steering; two carriages at rear. Corner support is afforded by cables from 16 ft., 10x10-in. timber carried on jack in center.

SOLID WALLS of brick, without any window openings, inclose new 361x561-ft. factory building, covering 5 acres, of Simonds Saw & Steel Co. Shop-welded structure is air-conditioned and artificially lighted.

PERSONNEL (inset, above) on factory project includes, left to right: N. R. CRATER, construction superintendent for Austin Co.; G. K. SIMONDS, general manager for owner; and J. K. GANNETT, vice-president of Austin Co.

Windowless Building

With Shop-Welded Steel Frame Covering 5 Acres, Is Air-Conditioned and Lighted By Special Fixtures

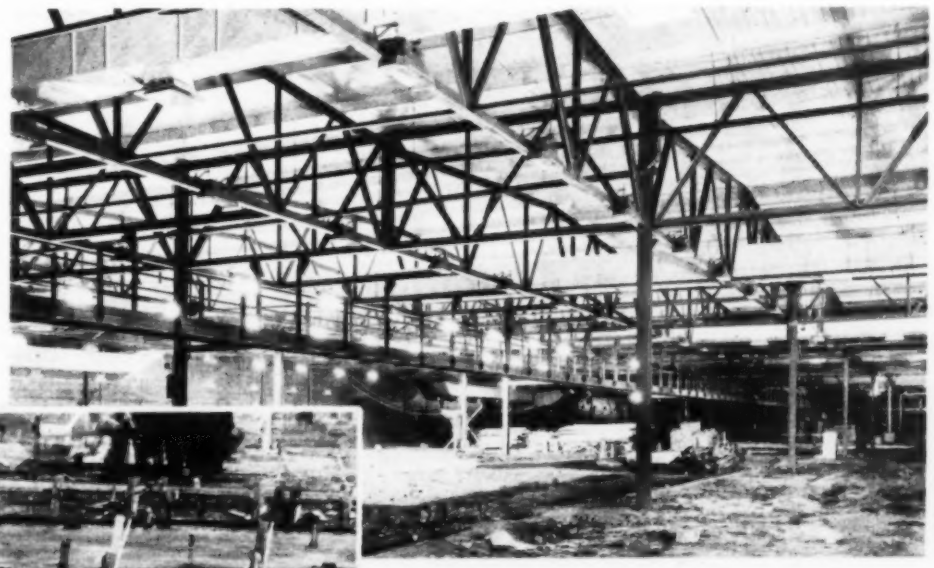
THE NEW PLANT of the Simonds Saw & Steel Co., at Fitchburg, Mass., designed and built by The Austin Co. of Cleveland, Ohio, provides a single, air-conditioned windowless room 5 acres in area (361 x 561 ft.) in which operations previously carried on in three old plants comprising 17½ acres will be accommodated, with almost an acre to spare. There are only 56 intermediate columns in the entire structure which has eight 70-ft. aisles with column supports every 40 ft.

Structural steel for the building, amounting to 1,020 tons, was entirely shop-welded and includes special jack trusses which support intermediate roof sections in these large bays. The roof is of a special design which provides maximum insulation with a minimum weight. The underside of the ceiling is of perforated metal of hollow-rib design, into which slab cork has been placed. This, in turn, is covered by two ½-in. layers of insulated board in staggered arrangement and the entire roof is topped by a 15-yr. bonded waterproofing. Service facilities, including coat rooms, wash rooms and lavatories, as well as air conditioning units, are located in four lean-to buildings which extend out from the side walls on east and west.

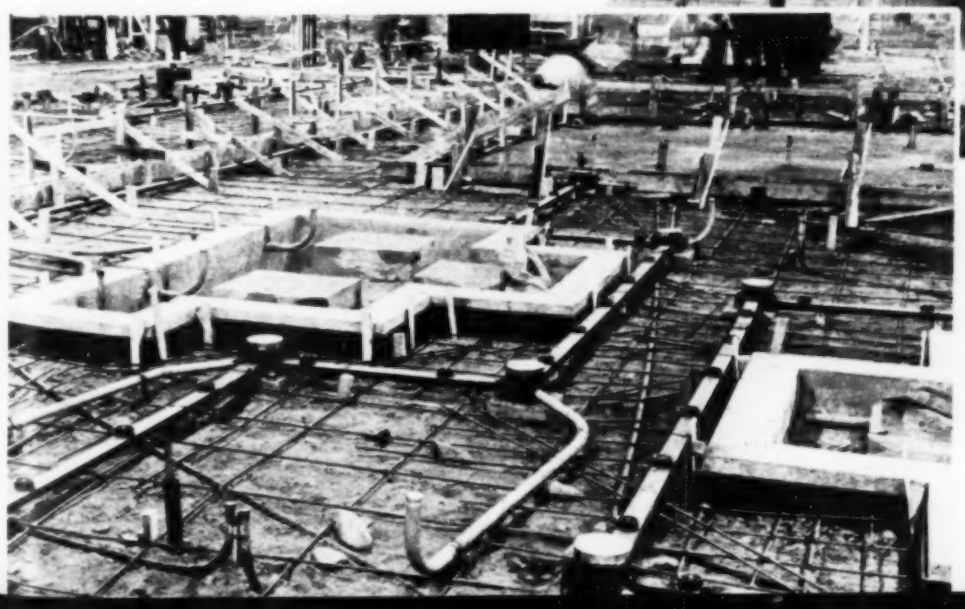
The outer walls are composed of buff colored face brick and used common brick, arranged in a dramatic design with contrasts which emphasize the horizontal sweep of the entire structure. A dead air space has been provided between the outer wall and the inner wall which is of acoustic-type cinder block.

Daylight is completely excluded by the solid walls which permit complete control of illumination without any variation day or night the whole year round. Lighting fixtures of a new type providing 50 lumens of light per watt are being installed at 1,440 positions throughout the plant. The fixtures, each of which consists of a 100-watt tube and a simple curved

(Continued on page 70)



STRUCTURAL STEEL for building, amounting to 1,020 tons, was entirely shop-welded and includes special jack trusses which support intermediate roof sections in large bays.



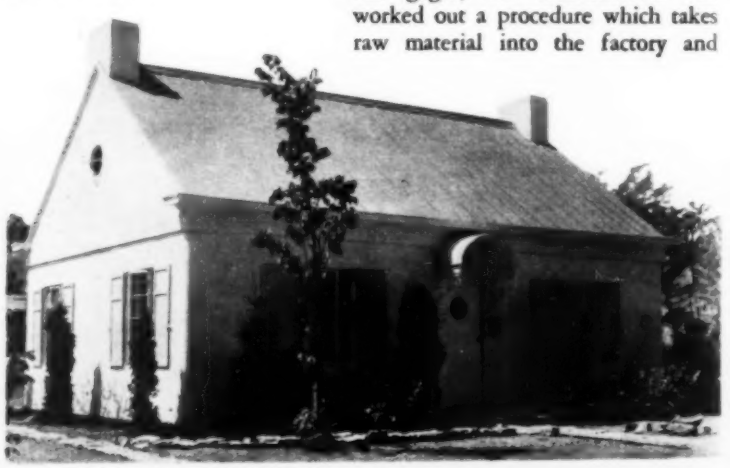
UNDERFLOOR CONDUIT (left) and service lines cut a roundabout course around special machine and furnace foundations. Power ducts alone totalled 17,000 ft., while all piping aggregated 38,000 ft.

TRANSPORTED INTACT through streets wide enough to accommodate complete unit, two-story house rides to permanent location in one piece. Ordinarily houses are transported in two sections to fit narrow streets and roads.

Houses BUILT IN FACTORY *Feature All-Welded Sheet-Steel Construction*

APPLICATION of controlled factory production methods to house construction has reached its highest level in Troy, Ohio, a town of 9,000 population, where the Hobart Welded Steel House Co. builds complete welded all-steel superstructures of four to six rooms in a specially designed housing shop and delivers the pre-built units to their foundations in the field. Developing the house design and production scheme around the use of standard 4x8-ft. steel sheets of various gages, the manufacturer has worked out a procedure which takes raw material into the factory and

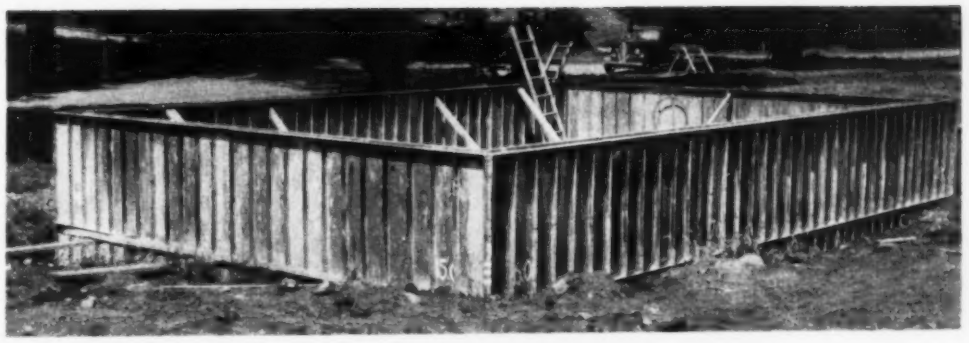
TWO-STORY SIX-ROOM HOUSE in Georgian style **(left)** comes to foundations in two sections completely pre-built and ready for occupancy. Delivered price, $4,500, hooked up in permanent location.



ONE-STORY FOUR-ROOM DWELLING completely finished and equipped for occupancy sells for $3,000 delivered to foundations. Architectural designs of welded steel houses follow best traditional styles, little likely to become outmoded.

TWO VARIATIONS (left) in steel house design. At right is standard six-room house sold at established price, while at left is seven-room dwelling in California style,—a departure from stock models.

WELDED STEEL DWELLINGS are designed, built and placed on foundations under direction of N. W. VAN AUSDAL, in charge of steel housing.



STEEL PANEL FORMS (right) appropriately serve construction of concrete foundation walls for factory-built welded all-steel house.

WELDED STEEL FORMS (left) are used for building concrete walls around areaways, after foundation walls have been completed.

sends out fully insulated and completely equipped dwellings ready for placement on foundation walls. A house can be built and all mechanical equipment installed in three weeks; two additional weeks are allowed in the factory for painting and decoration before the dwelling is ready for delivery to its permanent location.

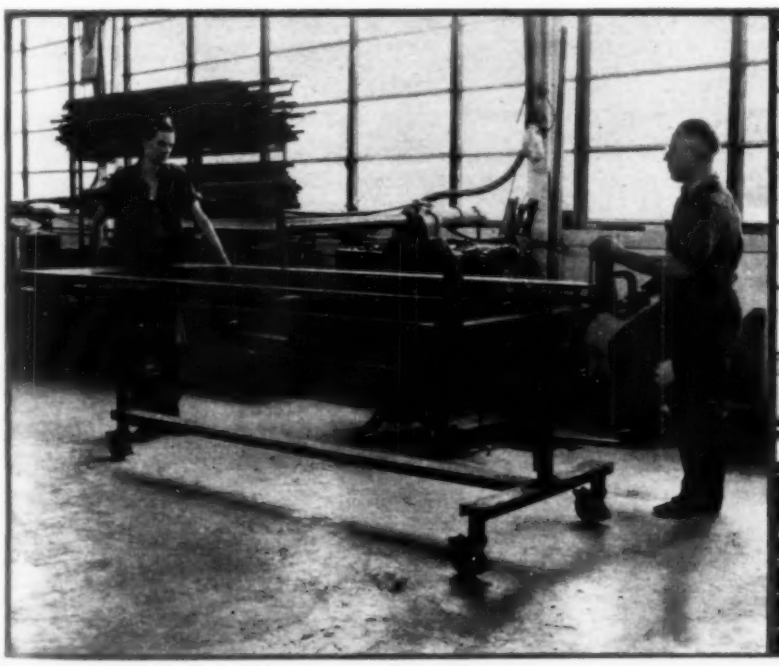
To facilitate transportation, the houses are built with a hidden slip joint which permits their being separated into two sections for delivery by special pneumatic-tired trailer to the foundations. At the site, about one week is required to set the superstructure on the foundations and make service connections. Delivered and set in place, a fully equipped superstructure costs $3,000 for a one-story unit of four rooms and bath or $4,500 for a two-story house of six rooms and bath. An intermediate one and one-half story size, containing five rooms and bath, sells for $3,500. Steel one-car garages are sold at a delivered price of $300 each.

Construction Features—Interesting construction details are revealed by accompanying photographs. The entire house forms a rigid welded unit. With the exception of 8-in. steel channels used as sills and interior girders in the first-floor chassis, practically all framing members are formed in the factory by a press brake bender capable of handling pieces up to 12 ft. long.

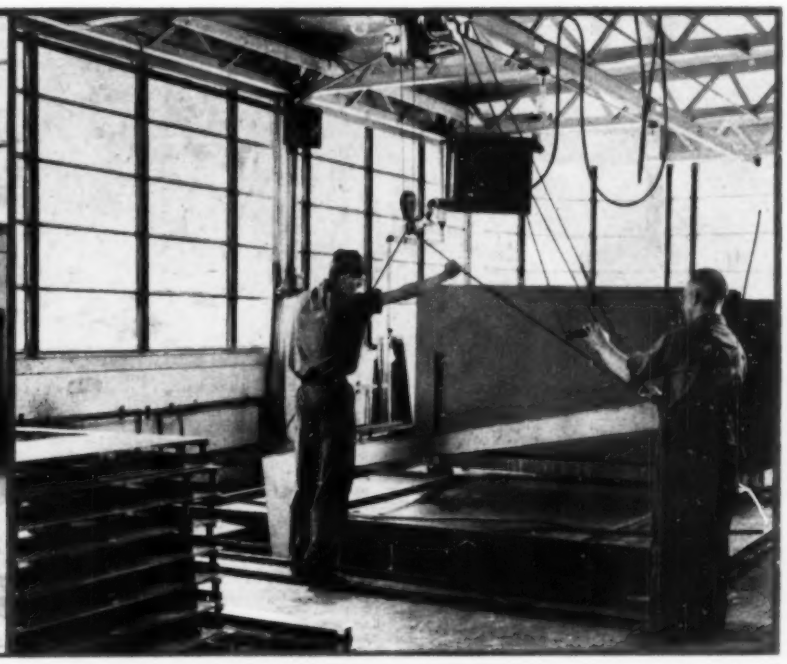
First-floor joists are 4-in. channels of 16-gage steel, welded into the sills and girders, carrying a floor of 11-gage plate on which the walls and partitions rest. (All gages are U. S. Standard.) Exterior double walls of sheet steel, 18-gage on the outside and 16-gage on the inside, have a 3-in. inner space filled with loose rock wool. Partitions are similarly constructed and insulated. Wall and partition panels are made up in 4x8-ft. units, with the sheets in each panel connected by small welded cross-struts which minimize contact and danger of condensation.

Ceilings and upper floors rest directly on the well and partition units, making the ceiling heights 8 ft. throughout. Horizontal filler channels are inserted between the sheets of the double walls at both bottom and top of the panels. The walls are sealed against moisture penetration into the rock wool insulation by a mixture of odorless tar and cork poured hot into the bottom and top of the panels after erection. This sealing material is retained by the filler channels. A cap channel covers the top of the wall and provides bearing for the ceiling.

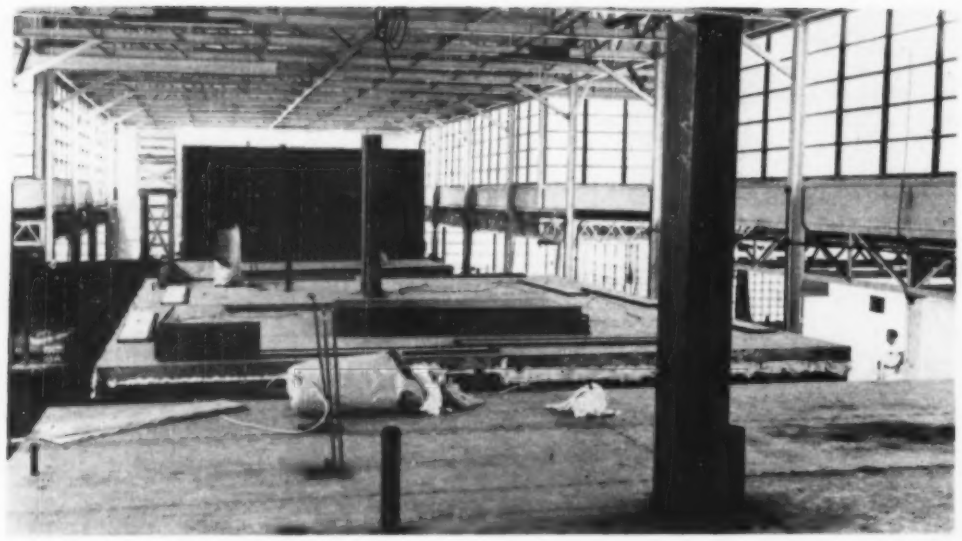
Floors and Ceilings — Ceiling frames and upper floor frames are fabricated as separate units, with channel joists welded to the flat sheets. The ceiling is 18-gage sheet backed up by 3-in. channels on 12-in. centers, while the floor is 11-gage steel supported by 4-in. channel joists spaced 8 in., c. to c. In two-story construction, ceiling and floor panels are laid with joists parallel, the floor frame being supported above walls and partitions by box members 1-in. deep (made up of two channels) laid across the ceiling joists.



SPOT WELDING MACHINE facilitates shop fabrication of steel panels. Operator is completing welded door panel.



FOLLOWING FABRICATION in welding machine, panel is dipped in tank of iron oxide primer.



MECHANICAL EQUIPMENT (such as air ducts, flues and plumbing pipes, shown here extending through second floors) is installed during assembly of steel houses in shop. Four units are under construction.

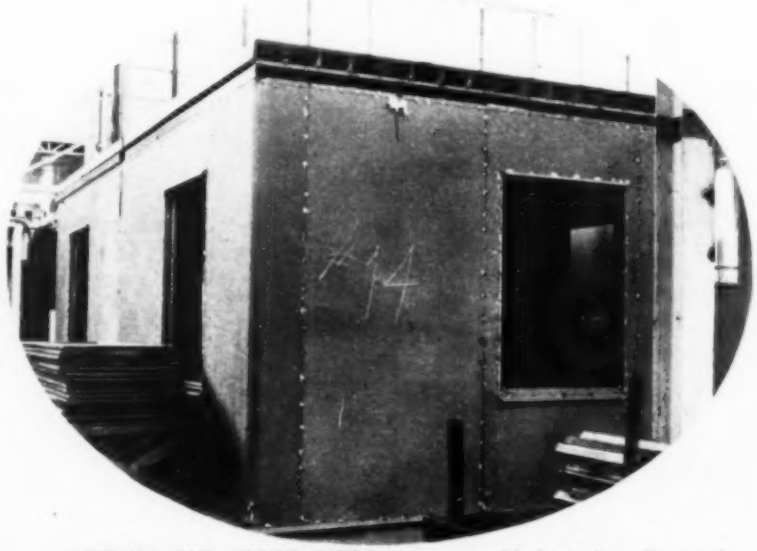
Wall panels of the second story rest on the floor units, as in the first story, and the gap between the first and second story wall panels is closed by a belt course consisting of a flanged steel channel about 2 in. deep filled with fiber insulating board set in mastic. Roofing is 18-gage steel with standing seams, supported by 3-in. steel channel rafters in hip roofs and by 4-in. channels in flat roofs.

Quantities — A single-story four-room house takes 12 tons of steel, and a two-story six-room dwelling requires 22 tons. Both of the houses are 21x30 ft. in plan, as also is the intermediate five-room dwelling. For the six-room unit, 4 tons of insulating material is used, giving it better insulation, the manufacturer claims, than is found in the ordinary small electric refrigerator.

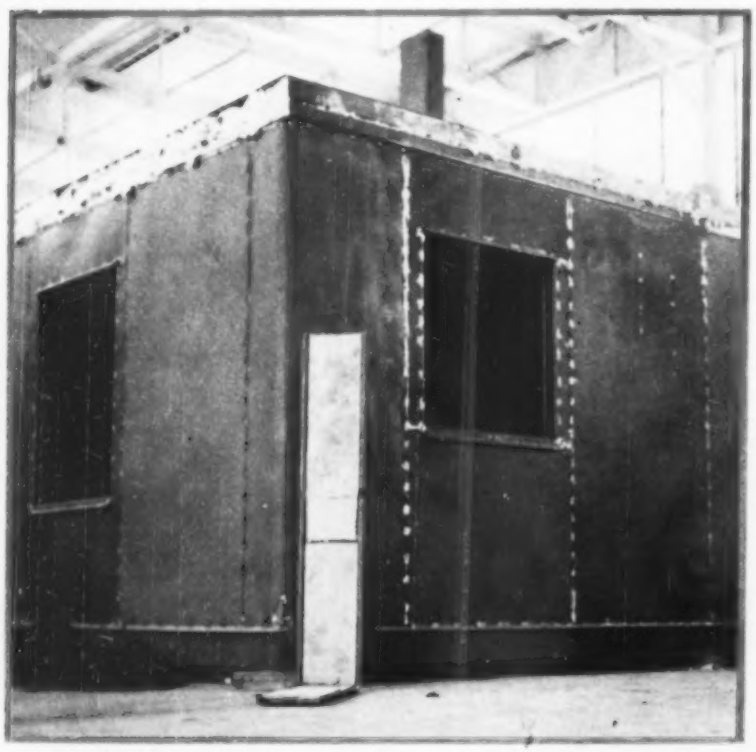
Insulation — Loose rock wool insulation is placed and rodded by hand in the hollow walls and partitions. Floors are sound-deadened and insulated as required for comfort. To the under side of the first floor the manufacturer applies ¼ in. of sound-deadening mastic compound. The second floor is similarly treated, and 2 in. of rock wool pads is placed over the first story ceiling. Top story ceilings are covered with 5 in. of

(Continued on page 68)

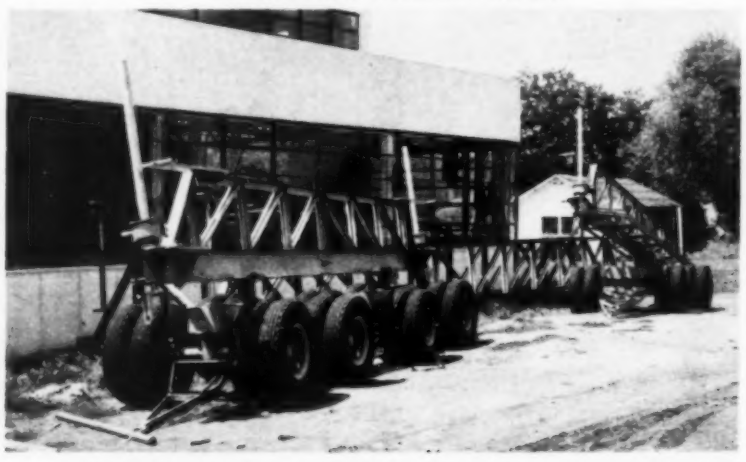
DOUBLE WALLS of arc-welded steel house receive thorough insulation of loose rock wool placed and rodded by hand. Two men at top of unit are insulating second-story walls. Portion of welded steel one-car garage appears at left.



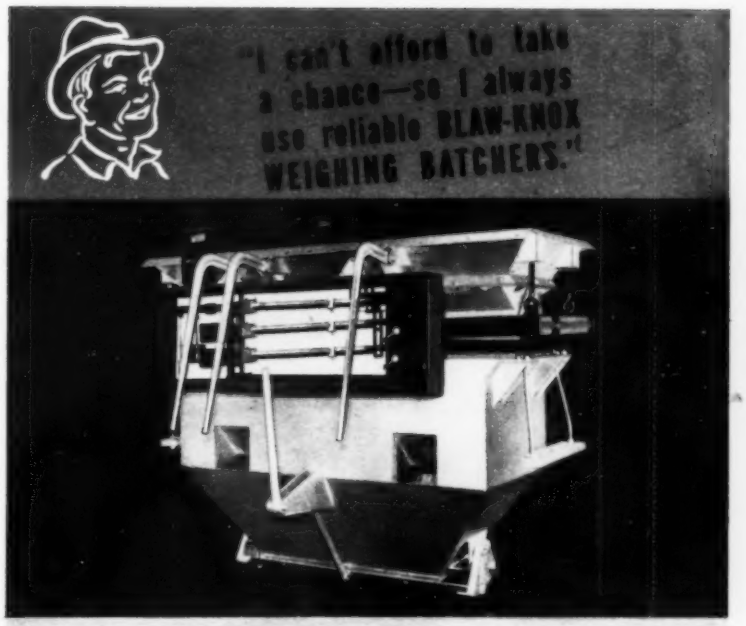
CEILING AND FLOOR UNITS rest on welded steel wall panels assembled in house. Note 12-in. spacing of ceiling joists and 8-in. spacing of floor joists. Window panels are fabricated ready to receive steel casement windows.



INSULATION is placed in second floor to prevent heat transfer between floors and from outside into house. Corner section of belt course, to be placed around house at second floor level, stands in front of structure. Note lining of insulating material inside belt-course metal channel.



DISMANTLED TO SAVE SPACE when not in use, two-part trailer with connecting truss girders carries completed steel houses in two sections from factory to foundations.



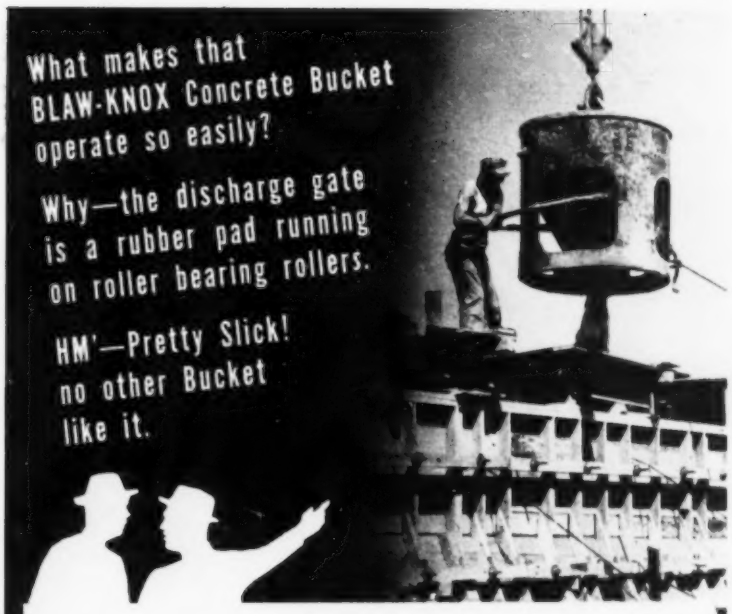
To quickly and accurately measure AGGREGATES, CEMENT AND WATER, Blaw-Knox Weighing Batchers are standard equipment in widespread use by road contractors, for general construction, material yards, and ready mixed concrete plants. They satisfy all modern specifications. Furnished for manual or automatic operation.

The reliability of Blaw-Knox Weighing Batchers is acknowledged by thousands of users. Send for Catalog No. 1566.

BLAW-KNOX DIVISION of Blaw-Knox Company
FARMER'S BANK BUILDING PITTSBURGH, PA.

⑨

BLAW-KNOX *Aggregates and Cement*
WEIGHING BATCHERS


What makes that BLAW-KNOX Concrete Bucket operate so easily?
Why—the discharge gate is a rubber pad running on roller bearing rollers.
HM'—Pretty Slick! no other Bucket like it.

• Controllable discharge, Blaw-Knox CONCRETE BUCKETS are a popular concrete placing unit. Used by contractors everywhere.

Send for a copy of the catalog on Blaw-Knox Concrete Buckets, No. 1586.

BLAW-KNOX DIVISION of Blaw-Knox Company
FARMERS BANK BUILDING · PITTSBURGH, PA.

BLAW-KNOX *Roller Gate*
CONCRETE BUCKETS

Yes, sealed ball bearing sheaves keep lubrication in and dirt out, to prevent excessive wear and prolong the life of the bucket. In addition Blaw-Knox Buckets make generous use of tough alloy steels to avoid excessive dead weight and provide worthwhile savings in rehandling costs. Write Blaw-Knox today for Bulletin 1606.

16

BLAW-KNOX BLAW-KNOX DIVISION • OF BLAW-KNOX CO. • Farmers Bank Bldg. Pittsburgh, Pa.
Digging and Rehandling **BUCKETS**

SEVEN MATERIALS IN ONE BIN?
"You Bet—this new BLAW-KNOX plant accurately measures and loads aggregates, cement, and water into truck mixers."

Blaw-Knox Truck Mixer Loading Plants include overhead storage bins for aggregates and cement; accurate Weighing Batchers for aggregates, cement and water; arranged for manual or automatic operation; complete conveyors for handling materials from cars or trucks to bins, when desired—all properly designed and built to your requirements as an efficient unit for truck mixer loading. See Blaw-Knox Catalog No. 1582.

15

BLAW-KNOX BLAW-KNOX DIVISION • OF BLAW-KNOX CO. • Farmers Bank Bldg. Pittsburgh, Pa.
TRUCK MIXER LOADING PLANTS

Present and Accounted For

A Page of PERSONALITIES

W. B. BRANTLEY, formerly assistant engineer, has been promoted to the post of chief engineer of the State Highway Board of Georgia, succeeding E. A. Stanley.

ARTHUR J. SACKETT, president of the Mason & Hanger Co., of New York City, has been selected as the new president of the General Contractors Association of New York. Mr. Sackett's firm, one of the oldest in the United States, has been identified with the construction of many large-scale projects, including Grand Coulee dam on the Columbia River in Washington, and Lincoln vehicular tunnel under the Hudson River between New York and New Jersey.

M. J. HOFFMANN was appointed by Gov. Stassen, Jan. 4, State Highway Commissioner of Minnesota, succeeding N. W. Ellsberg. An engineering graduate of the University of Minnesota, Mr. Hoffmann entered the state highway service in 1914 and became district highway engineer. During the war he was lieutenant with the Twenty-third Engineers overseas. In 1921 he became maintenance engineer and later became chief bridge engineer and budget director for the Minnesota Highway Department.

ROBERT S. BEIGHTLER is the new director of the Ohio Department of Highways, succeeding John Jaster, Jr. He served in the department from 1919 to 1930 in various capacities from division engineer to assistant director and chief engineer. He then entered the contracting business as member of the firms of Stellhorn & Beightler and of the Midland Construction Co. During the World War he served with the Rainbow Division and subsequently was on the War Department's General Staff in Washington, D. C.

C. J. SHERLOCK, JR. is the newly appointed director of the Alabama Highway Department, succeeding H. H. Houk. A graduate of Georgia "Tech", Mr. Sherlock began service with the Alabama Highway Department in 1922 and advanced through the grades of draftsman, inspector, resident engineer, division engineer and chief engineer. The new one-man commission created in February and filled by Mr. Sherlock's appointment supersedes the former three-man commission in Alabama.

COL. HENRY M. WAITE (below) has been named chairman of a newly formed technical public works committee to advise the National Resources Committee on problems relating to the economics and timing of public construction activities. Col. Waite has a long record of achievement in the railroad and municipal engineering fields. He was formerly city manager of Dayton, Ohio, and city engineer of Cincinnati. He directed the building of the $40,000,000 Cincinnati Union Terminal. During the World War he served as deputy director general of transportation under Gen. W. W. Atterbury, and in 1933 became deputy administrator of PWA in Washington, D. C.

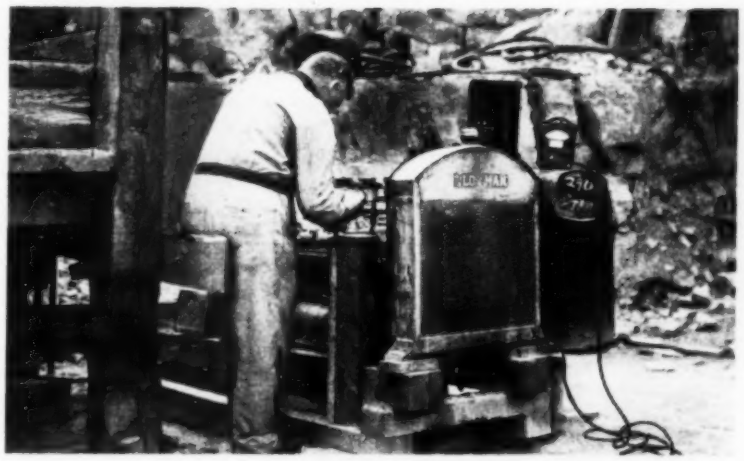
STANDARD OIL AUTOMOTIVE ENGINEERING SERVICE

SAVES THESE FLEET OPERATORS REAL MONEY

TRUCK OPERATOR MAKES SAVING EQUIVALENT TO 2c PER GALLON

"It was just like taking 2c per gallon from the price of gasoline" reports the engineer. Alike, except that when this saving was made by the Standard Automotive Engineer through improved engine performance it meant that this customer still had the advantage of using a high quality gasoline. His trucks still had full power on the road. He was sure of a further saving in maintenance that is certain to follow when equipment is kept operating at peak efficiency.

One of the modern trucks operated by this customer, the National Furniture Mfg. Company of Evansville, Indiana, is shown above with the Standard Automotive Engineer preparing to make a road test. This test is an important part of the service these Engineers render. It provides a check on engine performance under actual operating conditions, complete insurance against sacrificing power for gasoline savings.



ENGINEER SAVES CONTRACTOR 25% ON FUEL BILL

Commenting on the work done by the Standard Automotive Engineer this customer writes, "After cleaning, overhauling and adjusting carburetors, checking and setting distributor points, testing condensers and coils and making various other tests I find that he has cut my fuel consumption at least 25%. Not this alone but the general efficiency of all the engines has been greatly increased."

High fuel bills had about convinced this customer to try a cheaper gasoline. Here again, the Standard Automotive Engineer proved the true economy of good products, properly applied.

SCHOOL BUS SYSTEM GETS A 10% SAVING

Even on the modern equipment operated by the Beaverton Rural Agricultural School at Beaverton, Michigan, a Standard Automotive Engineer found ways to reduce gasoline consumption 10.3%. A saving of approximately 1000 gallons of gasoline a year. Equivalent to a saving of over 1c per gallon. Any way you say it, it means just one thing. Standard's Engineering Service and Standard Oil products did it again.

ASK YOUR AUTOMOTIVE ENGINEER

what he does and how he finds these economies in fleet operating costs. Call the nearest Standard Oil (Indiana) office or write 910 South Michigan Avenue, Chicago, Illinois.

STANDARD OIL COMPANY (INDIANA)

The Shovel With The Perfect Balance
Try This Test
• Lay one of these new ABW Solid Shank Shovels on a table or desk, balanced with the blade and socket projecting over the edge of the table and the handle poised free of the table. Then tip the blade down to either side, release and watch the shovel right itself. This is the perfect balance which no other solid shank shovel has.
AMES Since 1774

● A new re-designed socket gives to the ABW Solid Shank Shovel a perfect balance. The new high bend has achieved for this famous shovel a balance unequaled in any other solid shank shovel.

To the users of shovels this is a most important development and one that will be welcomed by buyers of shovels. Added to this exclusive feature ABW Solid Shank Shovels are equipped with the famous Shock Band, which gives more handle strength to the shovel.

Made from one solid bar of steel ABW Solid Shank Shovels are the strongest shovels made, give the longest service and with their perfect balance, make for easier shoveling. Ask your jobber about this new re-designed bend and the perfect balance.

AMES BALDWIN WYOMING CO., Parkersburg, W. Va., North Easton, Mass.
ABW Products: Shovels, Spades, Scoops, Forks, Hoes, Rakes, Post Hole Diggers, Agricultural Handles

Queensboro Bridge

(Continued from page 47)

terminals in Queens, one at Van Alst Ave., and the other at Thompson Ave. The project involved the removal and disposal of the existing granite block and wood block roadway and the construction of a new reinforced concrete pavement. The total length of roadway paved was 10,112 lin. ft. —a little under 2 mi. The width varies from 22 ft. 6 in. to 44 ft., and the total area paved was 276,190 sq. ft.

Work was begun on the approaches on July 5, having been postponed so as not to interfere with holiday traffic over the Fourth, and was continued without interruption until its practical completion on Oct. 3. On this latter date the entire upper roadway was closed to traffic and work was started on the main span.

At the peak 1,100 men were employed. The job was done under trying working conditions. Work on the main spans, where the entire decking was removed, had to be carried on directly over the main roadway of the bridge with its extremely heavy traffic. In spite of such conditions it was completed with no accident or damage to the public or its property and, for all the hazards of the job, with no major injury to any of the personnel employed on it.

In addition to the construction of the new reinforced concrete slab pavement of modern design over the entire roadway, the work included the reinforcing of existing steel stringers, the installation of four new expansion joints, the construction of a new drainage system, and the installation of a permanent traffic white line between traffic lanes.

The roadway proper is composed of three distinct types of reinforced concrete slabs. On the main spans between the two anchor piers, a distance of 3,725 lin. ft., with a width of 22 ft. 6¾ in. and covering a total area of 84,200 sq. ft., the construction comprises a 3-in.-thick concrete slab reinforced with a 2½-in.-thick I-Beam Lok steel mat. On the Manhattan and Queens approaches to the main spans, a distance of 2,113 lin. ft., by approximately 26 ft. in width, covering an area of 54,000 sq. ft., the concrete slab used was 5 in. in thickness, reinforced with a 3½-in. steel truss mat welded to the existing ½-in. steel plate roadbed. At the entrance approaches at the Manhattan and Queens ends of the roadway, a distance of 4,274 ft., varying from 26 ft. to 44 ft. in width, a total area of 137,391 sq. ft., the type of construction used was a 5-in. concrete slab reinforced with two layers of heavy welded steel reinforcing fabric, the slab being laid on top of the existing 6-in. reinforced concrete slab roadbed.

In the course of the job the WPA workers removed 850,000 old granite blocks (8500 tons), 350,000 old wood blocks, 800 tons of old asphalt pavement, 1,600 tons of old sand pavement cushion and 1,600 tons of existing structural steel. They laid, bolted and welded in place 628 tons of I-Beams-Lok steel mats, laid and welded in place 146 tons of steel truss mats, and placed 96 tons of steel wire mesh reinforcing fabric. They erected 81 tons of structural steel Z-bars and diaphragms

(Continued on page 68)

LET'S LOOK AT THE RECORDS

At first glance, these two 28-inch dredge liners *do* make you think of huge phonograph records. Actually, their stories are sweet music to engineers striving to tone down excessive losses from abrasion.

The steel liner, at left below, handled less than 1½ million cubic yards of material on the Ft. Peck Dam. Yet look at its condition!

On that same job, a liner of Ni-Hard, an extremely hard Nickel-chromium alloyed cast iron, shown at right below, handled 2⅓ million yards with only the wear shown by this photo. After inspection this Ni-Hard liner was reinstalled to deliver much more service.

Wherever wear is your problem, Nickel cast irons often offer the most economical answer. Special compositions containing Nickel — such as abrasion resistant Ni-Hard — will go a long way in solving costly replacement jobs. To obtain practical, helpful money-saving information please write us, explaining your specific materials requirements.

A—Steel liner, originally installed on the same 28-inch dredge, after only 1,470,500 yards. This steel liner was replaced by the Ni-Hard casting shown at right.

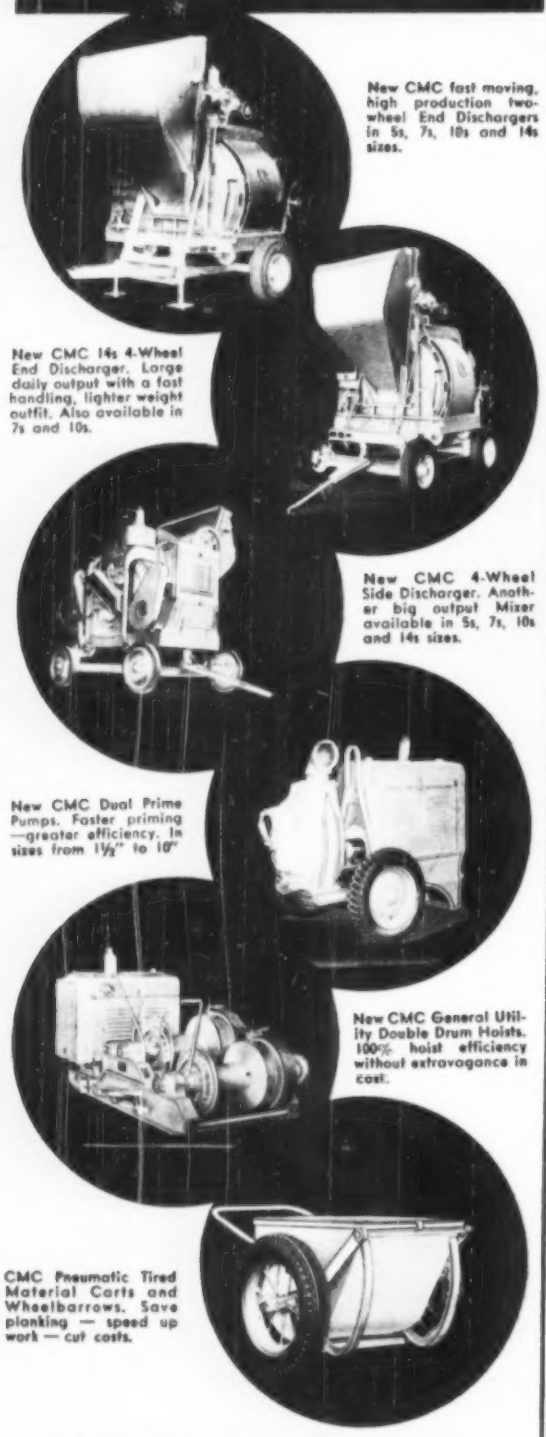
B—Cast by Thomas Foundries, Inc., Birmingham, this Ni-Hard Nickel iron liner handled 2,391,860 cubic yards of material and after inspection was put back in service to deliver still more yardage.

NI-HARD*

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N.Y.

* Reg. U. S. Pat. Off. by the International Nickel Company, Canadian Patent No. 281,986

CMC SETS A NEW "HIGH" IN PROFIT MAKING EQUIPMENT



New CMC fast moving, high production two-wheel End Dischargers in 5s, 7s, 10s and 14s sizes.

New CMC 14s 4-Wheel End Discharger. Large daily output with a fast handling, lighter weight outfit. Also available in 7s and 10s.

New CMC 4-Wheel Side Discharger. Another big output Mixer available in 5s, 7s, 10s and 14s sizes.

New CMC Dual Prime Pumps. Faster priming —greater efficiency. In sizes from 1½" to 10"

New CMC General Utility Double Drum Hoists. 100% hoist efficiency without extravagance in cost.

CMC Pneumatic Tired Material Carts and Wheelbarrows. Save planking — speed up work — cut costs.

NEW CMC CATALOG READY!

The brand new CMC catalog —packed with illustrations and information on the entire CMC line including Wonder Tilting Mixers, Saw rigs, Plaster and Mortar Mixers. Yes, it's "the profit line for '39". Write for your copy today.

CONSTRUCTION MACHINERY CO.

WATERLOO, IOWA

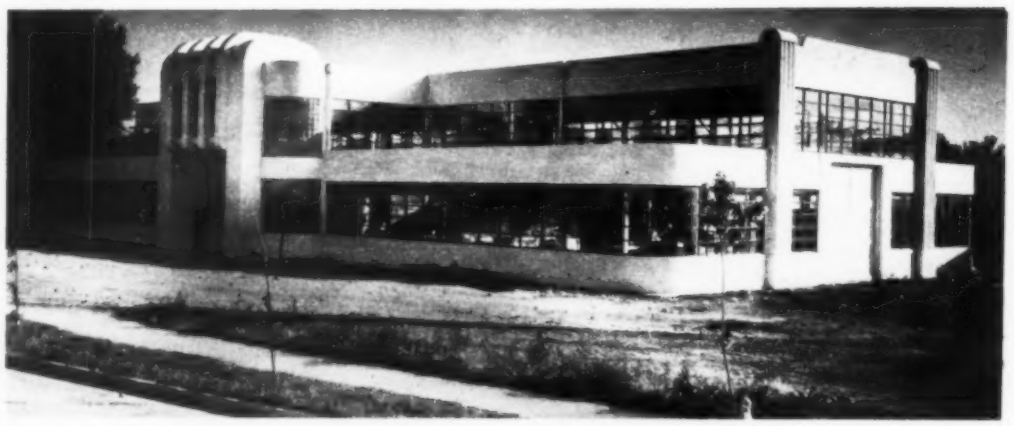
(Continued from page 66)

and 24 tons of new steel expansion joints. They laid 4,200 cu. yd. of ready-mix concrete. The welding done totaled 37,600 lin. ft., or 7 mi. Form work required the use and re-use of 45,000 sq. ft. of plywood, and the scaffolding used and re-used 4,000 pieces of scaffold plank—about 11 lin. mi. Six miles of 1¼-in. rope were used for hanging the scaffolding and 2 mi. of 11/16-in. rope for safety protection lines. Some 45,000 cu. ft. of acetylene and 140,000 cu. ft. of oxygen were used in burning out steel.

The completion of this modern roadway will eliminate many maintenance items, costly to the city, which were unavoidable with the old pavement. These include the repairs to the steel understructure, the renewal and repairs to wood-block and asphalt pavement—formerly almost a daily occurrence—and the adjustment of the obsolete expansion plates. Furthermore, the accidents due to skidding, which occurred very frequently during bad weather, should be entirely eliminated by the non-skid nature of the new roadway.

Factory Built All-Welded Houses

(Continued from page 62)



SPECIALLY DESIGNED MODERN BUILDING of electrically welded steel and glass construction houses manufacturing activities of steel housing organization.

granulated expanded-mica insulation. The chimney has an 8-in. flue incased in a 3-in. rock wool insulation placed between double steel walls.

Manufacturing Process — Fabrication of panels and assembly in the house go on simultaneously in the shop, the entire procedure being completed in the three-week construction period previously mentioned. The 4x8-ft. wall panels are made in three standard types: window, door and straight wall. Steel casement windows are purchased, but steel doors for the entire house are manufactured in the plant.

A spot-welding machine speeds the fabrication of panels. When assembled in the structure, the joints between panels are tack welded and are caulked with Egyptian lacquer filler, — the same material that is used to fill holes in castings. Formed steel is utilized for interior trim and moldings.

Mechanical equipment such as copper water pipes, drain pipes, gas pipes, electric wiring and ducts for forced circulating air heating are installed as the house is assembled. To fit the duct system for summer cooling by air circulation, as well as for winter heating, duct outlets in the two-story houses are placed in the second story ceiling and the first story floor. A gas or coal furnace with a thermostatically controlled fan, also manufactured by Hobart, is supplied with the house, as are all kitchen and bathroom fixtures and cabinets, electric outlets and fixtures, window valances and curtain rods, bronze screens and ornamental shutters. When delivered and hooked up, the house is complete and ready for occupancy.

Painting — Fabricated steel panels are dipped in iron oxide metal primer. After a house has been assembled, welded and caulked, the exterior receives a coat of special metal paint in which mica is mixed to give a rough texture. The final outside coat, applied after the house has been erected in the field, consists of ordinary lead paint. Interior painting, which is completed before the house leaves the shop, follows a similar program of rough texture coat covered by color coat, with some variation in the paint ingredients. Kitchen and bathroom floors are covered with linoleum, and other floors are painted in flat colors.

½-YD. GASOLINE SHOVEL grades 30-acre plot for steel house construction and digs cellars at cost of $15 each, as compared with former cost of $100 for cellars dug by hand.

Production — A new real estate development providing sites for about 100 homes is being built up with steel houses. Including an improved lot at $400, grading and landscaping at $200, and a concrete foundation with 8-in. basement walls at

(Continued on page 70)

Prevent WIRE ROPE Corrosion!

Proper wire rope lubrication prevents corrosion — maintains rope safety — lengthens rope life — reduces wear — saves money

CORROSION is one of wire rope's greatest enemies. Unchecked, it will greatly shorten the useful life of a wire rope. It can easily reduce the safety of a wire rope to a point where further use of the rope is hazardous. Yet, to the eye, the rope may appear only slightly rusty — most of the damaging corrosion may be confined to the hidden inner wires.

The first detrimental effect of corrosion is microscopic pitting — unseen to the naked eye. But it results in early wire breakage.

As the corrosion makes headway it becomes visible. It binds the wires — prevents their free movement, one against the other. The rope loses elasticity. Individual wires break. Ability to absorb impact and sudden shock becomes a gamble.

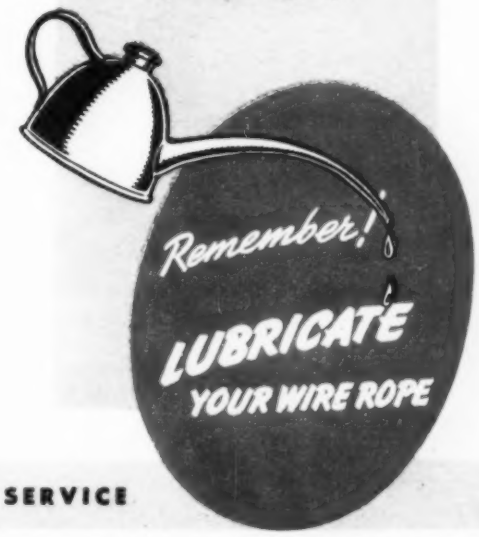
No wire rope can be furnished with enough lubricant to last a lifetime. Therefore, to prevent corrosion — to assure safety:

(1) Lubricate your wire ropes regularly; (2) with a lubricant especially made for wire rope application; (3) and suited to your own individual operating conditions.

This advertisement is published in the interest of all wire rope users, to help them obtain greater safety, service and efficiency from their wire rope.

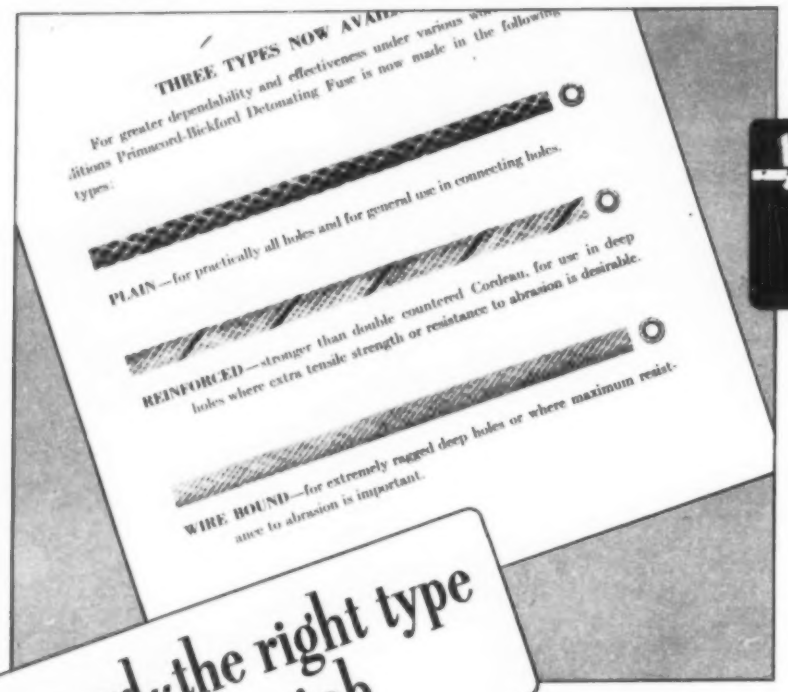
For advice on wire rope lubrication

FOR further information regarding the proper lubrication of your wire ropes, consult the nearest Roebling branch office or our main office, Trenton, New Jersey.



JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY BRANCHES IN PRINCIPAL CITIES

GOOD CARE OF WIRE ROPE PAYS BIG IN SAFETY AND SERVICE


THREE TYPES NOW AVAIL
For greater dependability and effectiveness under various
ditions Primacord-Bickford Detonating Fuse is now made in the following
types:
PLAIN—for practically all holes and for general use in connecting holes.
REINFORCED—stronger than double countered Cordeau, for use in deep
holes where extra tensile strength or resistance to abrasion is desirable.
WIRE BOUND—for extremely ragged deep holes or where maximum resist-
ance to abrasion is important.

Primacord—the right type for every job

Primacord-Bickford, the new insensitive detonating fuse, is made in these three types to meet every demand of an instantaneous blasting fuse.

Write for the free Primacord Booklet and complete information on this improved detonating fuse. THE ENSIGN-BICKFORD COMPANY, Simsbury, Conn., U.S.A. *Makers of Cordeau-Bickford Detonating Fuse — and Safety Fuse Since 1836.*

PB6

PRIMACORD-BICKFORD *Detonating Fuse*

From Boston and Buffalo To Baltimore —they're the Buckets to watch!
The Haiss is in the spotlight today—first choice of the men who KNOW buckets. Write or wire for prices and delivery. All sizes.
HAISS Hi-Power
FOR PAY LOAD CLAMSHELL DIGGING

In stock at New York, Philadelphia, Baltimore, Atlanta, Hartford and Los Angeles

GEORGE HAISS MFG. CO., INC., 139th ST. & CANAL PLACE, NEW YORK—DISTRIBUTORS EVERYWHERE

(Continued from page 68)

$400, a four-room one-story home totals $4,000. With $100 larger allowances for lot and foundations, plus $300 for a one-car garage, a complete six-room property comes to $6,000.

Direction — Present manufacturing plans were undertaken after test houses had been occupied for more than two years. The Hobart Welded Steel House Co. is a subsidiary of Hobart Bros., large manufacturers of electric welding equipment. E. A. Hobart, president, directs the activities of both companies, with N. W. Van Ausdal in charge of steel housing.

Windowless Factory Building

(Continued from page 59)

porcelain reflector, are mounted 16 ft. above the working floor and provide uniform shadowless illumination of 20 foot-candles, or better, throughout the room.

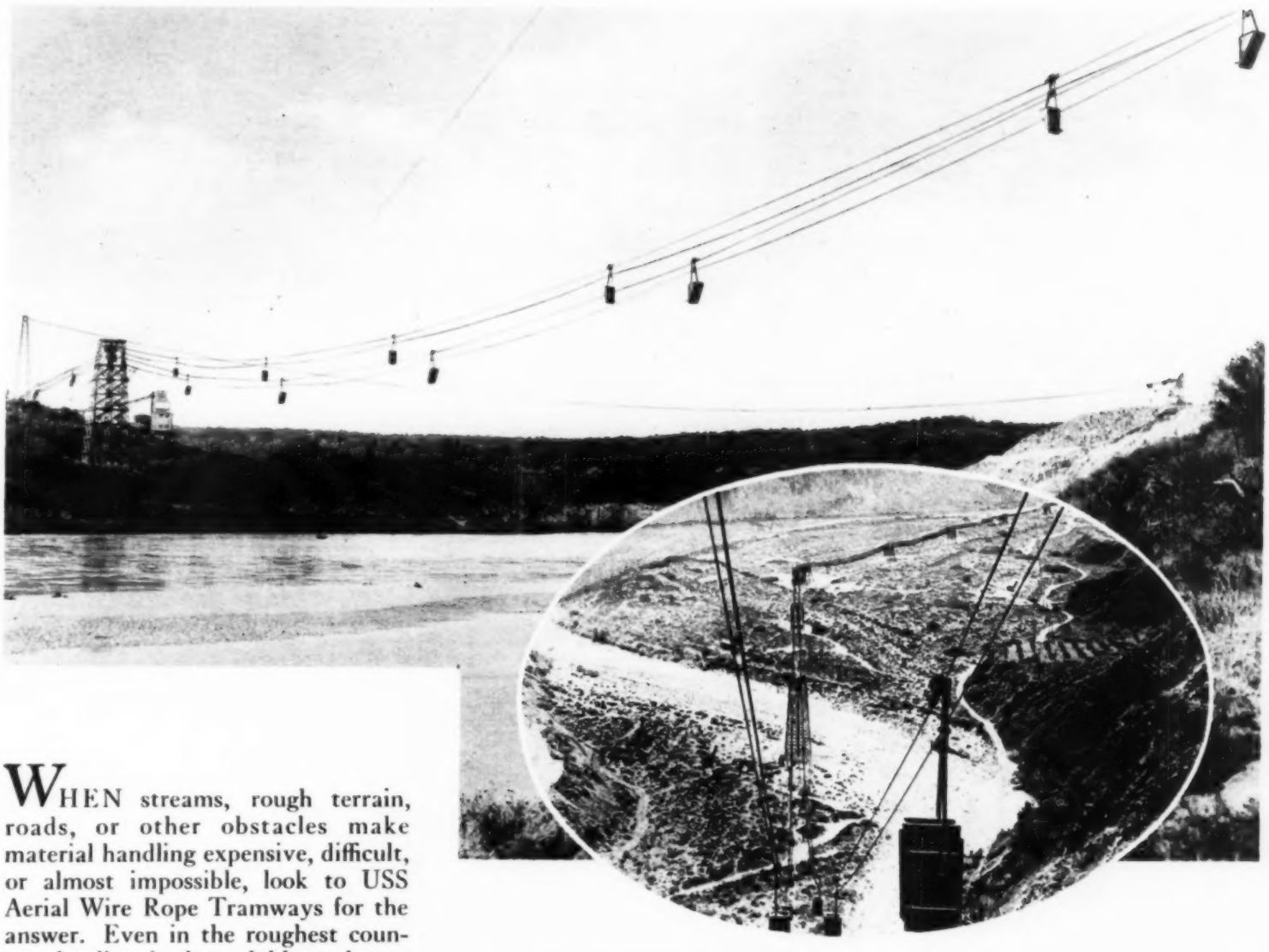
Nine major production lines extending the length of the plant will be set up with all service lines, including water, gas, steam, power, light, air and oil, carried direct to more than 1,000 machine and furnace locations. A 4-ft. steel walkway, a quarter mile in length, is suspended from the trusses and will provide the means of observing operations throughout every portion of the plant.

More than 38,000 ft. of piping (approximately 7½ mi.), including 10,000 ft. of cast iron pipe, 7,000 ft. of welded steel pipe, 10,000 ft. of black iron pipe, 5,600 ft. of galvanized iron pipe and 6,000 ft. of brass pipe, were required and have been almost evenly divided between underground locations and overhead installation in the roof trusses all alongside the columns. Special power ducts totaling 17,000 lin. ft. were installed on 10-ft. centers throughout the plant and have access openings every 2 ft. They are equipped with 280 standard and 265 special splice boxes. The installation of galvanized iron conduit totaled 60,500 ft., whereas 177,000 ft. (30½ mi.) of wire and cable were required.

The plant has a connected power load of 6,000 hp. and a total of 4,200 electric outlets, including light, machine power, transformers, switchboard and motor generators. All dust and exhaust gases developed in production operations at the plant are removed at their sources through underground networks of ducts.

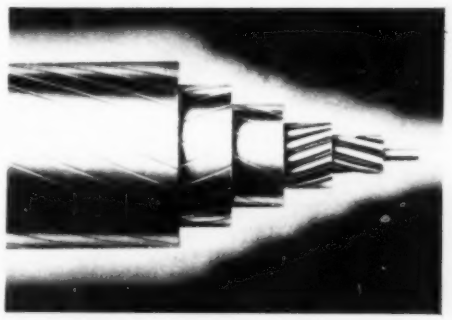
To meet the extraordinary requirements of the huge windowless plant where heat treating furnaces, annealing ovens, and more than 1,000 individual motor-driven grinders, cutters and other machines are operated in a single room shared by the factory offices, engineers of The Austin Co. and the Carrier Corp. collaborated in the development of an evaporative cooling system. Air will be circulated through the building, at a rate of approximately 400,000 cu.ft. a minute, via 3,000 lin. ft. of copper-bearing steel ducts which range from a size of 68 x 90 in. at the fans to 26 x 20 in. at the outlets farthest from the fan units.

TAKE THIS *Short-cut* TO LOWER HANDLING COSTS



WHEN streams, rough terrain, roads, or other obstacles make material handling expensive, difficult, or almost impossible, look to USS Aerial Wire Rope Tramways for the answer. Even in the roughest country, hauling is dependable and economical with aerial tramways. Rain, snow, mud, or ice add no problems. Access to right-of-way is usually not difficult, as all operations are generally above normal ground movements.

USS Aerial Tramways reduce hauling costs because they take the most practical means of overcoming the natural difficulties usually surrounding sources of building materials and the more isolated job locations.



Smooth surface, strength, toughness, sufficient flexibility and the Locked Coil Construction produce this ideal Tramway Track Cable.

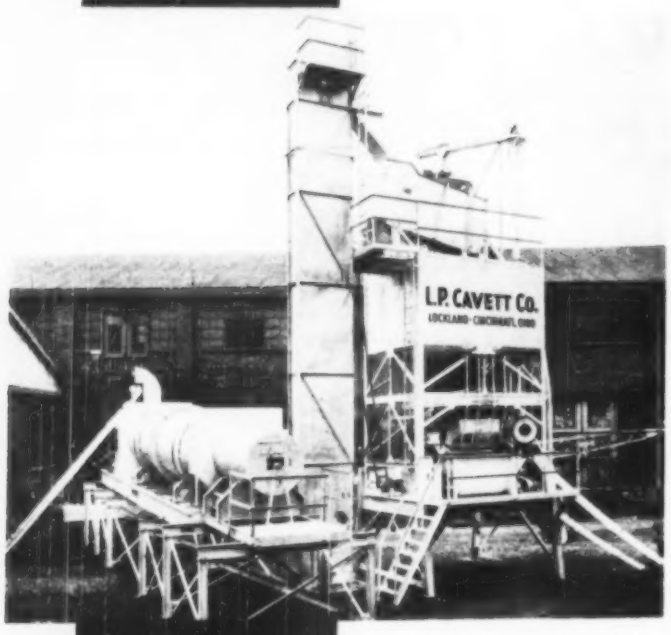
Our engineering staff can help you speed up handling and reduce costs where ground haulage is impractical because of cost, slowness, or unnecessary re-handling. The many types of USS Aerial Tramways from which they can choose, assure a recommendation which will answer your problem. You can save time . . . avoid bad weather delays . . . and reduce your haulage costs by using this modern, efficient system.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



MODEL P-A PLANTS ARE BUILT IN 4 SIZES

MODEL PA-15
1500 = Mixer
MODEL PA-20
2000 = Mixer
MODEL PA-30
3000 = Mixer
MODEL PA-40
4000 = Mixer

A NEW PORTABLE ASPHALT PLANT

in completely assembled sectional units easily moved by truck or rail and quickly erected without the use of a crane or gin pole.

Patents applied for — Built in 4 Sizes

Write for Bulletin T-260

HETHERINGTON & BERNER, INC.

701-745 Kentucky Avenue — Indianapolis, Ind.

for BIG savings on small equipment use COVIC DIESEL

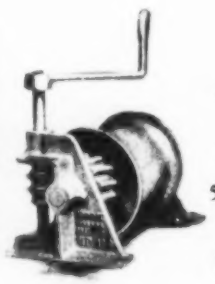
Slash power costs on old and new equipment... with the lightest, smallest full Diesel. 12½-20 HP, 4-cycle, 2 cylinder, pancake design, instant hand starting.

COVIC DIESEL

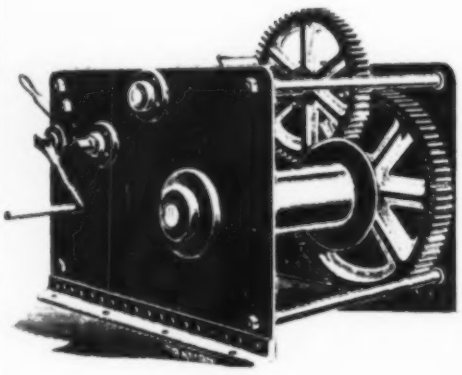
Division of the Northhill Company, Inc.

6822-24 McKINLEY AVENUE
LOS ANGELES, CALIFORNIA

DOBBIE WINCHES



A Dobbie Winch for every purpose. From 100 pounds to 50,000 pounds capacity on a single line. *With ease and safety.*



Dobbie Foundry & Machine Co.

Niagara Falls, N. Y.

Other Dobbie Products—Steel Derricks, Timber Derrick Fittings, Hand Winches, Motor Driven Winches, Blocks, Sheaves, etc.

EMPLOYEE RELATIONS

AT FORT PECK DAM

(Continued from page 44)

sistence and quarters and the date the eligible would be required to report for duty in case he should be selected for employment. Eligibles residing in the vicinity of the job are told that they will have to pass a physical examination given by a Government Medical Officer prior to appointment. Eligibles who live a considerable distance from the project are requested to report to a designated Government Medical Officer or to some other designated physician and have the physical examination form filled out and sent in with their acceptance. Only those who meet the physical requirements are offered employment.

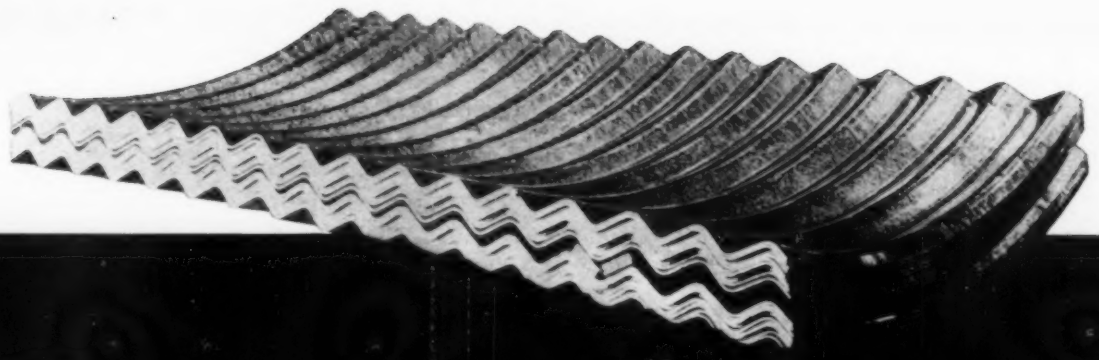
On Reporting for Duty

When the eligible has been offered employment and reports for duty, he is given a contract of employment to sign. This contract sets forth the major conditions of employment in which the employee might be interested. The eligible is also asked to fill out a card record showing the date and place of his birth, his previous Government service and the manner of his separation therefrom, the names and addresses of his nearest relatives and persons to be notified in case of serious illness, his personal description, his legal residence and present address, the name and address of his last employer, information about his citizenship, a record of his military service and complete information regarding his education. This record not only helps to identify the person as the one who filed the Civil Service application but is valuable as a quick reference when information is later needed regarding a particular employee. The applicant is then fingerprinted.

If the applicant does not pass a physical examination before reporting for duty he is given one before he is permitted to go to work. The physical examinations given common laborers are for the purpose of determining whether the employee has any disability or disease which might be aggravated by his work, prevent him from performing his duties in a satisfactory manner or subject his fellow employees to danger. It is not as thorough as the examination given Civil Service appointees. If the employee is to live in Government quarters he is given a slip to present to the steward, who assigns him a bed and furnishes information regarding meals, bath facilities and camp regulations.

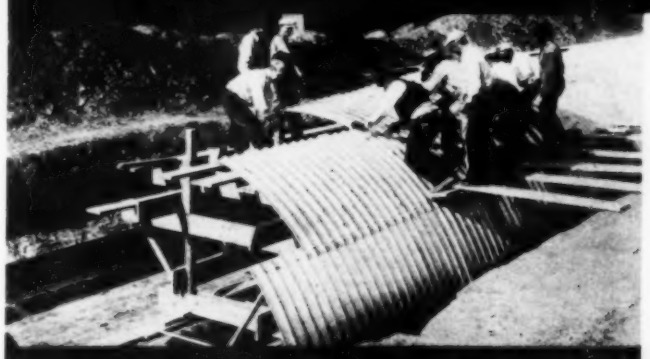
The employee is given a badge showing his employment number and a letter of introduction to his foreman. This letter states the payroll name of the employee, his badge number, his designation and salary, the date he is to report for duty and the number and date of the foreman's requisition from which he was employed. The employee is then directed to his foreman where he receives a general idea of the project and his job. Before he

(Continued on page 74)



Speed work... Trim costs

WITH ARMCO MULTI PLATE



Time and money were saved in constructing this large outfall sewer by using a Multi Plate arch set on a floor of concrete. No costly formwork or heavy equipment was needed.

By using Armco Multi Plate Pipe for this 165-inch diameter inverted siphon, the contractor saved $6000 and completed the job in half the time estimated for other materials.

An unskilled crew of 6 men erected this 13-foot span Multi Plate bridge in just 5 hours. The only tools required were six spud wrenches, four hand hooks and some 6 x 6 braces.

FOR BIGGER PROFITS IN 1939 meet the demand for large drainage structures with Armco Multi Plate. You'll land more jobs, complete them in half the time, and cut your overhead costs to rock bottom.

How are these results possible with Multi Plate? Chiefly because the heavy-duty corrugated iron plates come to your job ready for quick assembly. Bolting them together to fit specifications is almost as simple as tightening a wheel on your car. No skilled labor, costly formwork or heavy machinery is needed. And once the structure is finished, it can immediately be backfilled with earth. This shortens construction time to hours or days and assures "fool-proof" results at low cost . . . even in the coldest weather.

No wonder successful contractors everywhere are discovering that "there's more profit in a Multi Plate job." Find out for yourself this year. Plates are quickly available for full-round structures up to 15 feet in diameter; and for arches with spans up to 25 feet. See your local Armco representative or write directly to Armco Culvert Mfrs. Assn., Middletown, Ohio.

Armco MULTI ARMCO PLATE

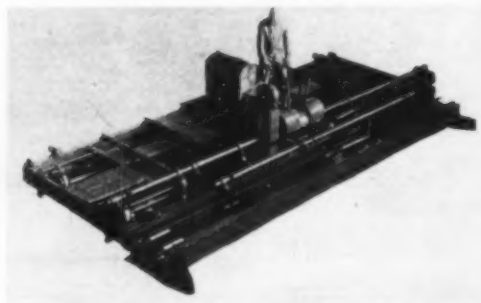
MULTI PLATE

"THE FOUR LEADERS IN CONCRETE ROAD CONSTRUCTION"

"GAS ELECTRIC FINISHERS"

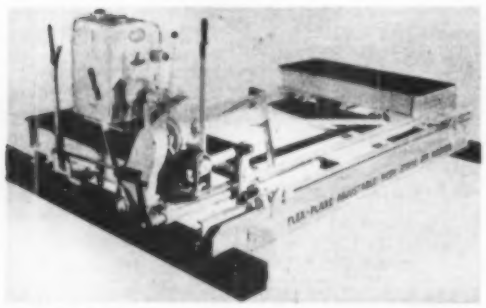
"FLEX-PLANE" gas electric finishing machine with 20" screed will screed forward and backward. It can be equipped with vibrated screed or vibrated tube and electric lights for night work.

"STRAIGHT GAS FINISHER"



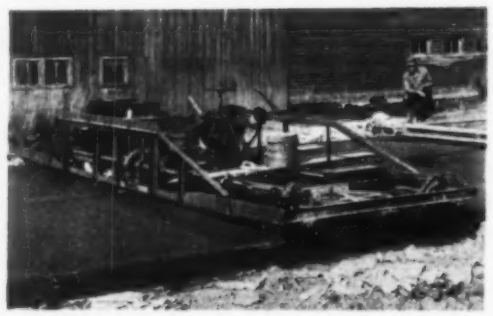
"FLEX-PLANE" straight gas finishing machine is equipped with 20" surfacing screed, quick crown adjusting device, four speeds forward and four reverse, four screeding speeds, adjustable throughout.

"MOTORIZED MESH STRIKEOFF"



"FLEX-PLANE" motorized mesh strike-off machine strikes off the concrete below the forms to the proper contour for placing the reinforcing steel mesh. It is adjustable four feet and is underslung to allow the paver bucket to pass over the machine.

"LONGITUDINAL AND TRANSVERSE CONTRACTION JOINT INSTALLING MACHINE"



"FLEX-PLANE" engine driven longitudinal and transverse contraction joint installing machine installs ⅛" asphaltic ribbon joint material. One man is required to operate machine and install the ⅛" ribbon joint material.

Catalog T-50 and Bulletin U-70 furnished upon request.

FLEXIBLE ROAD JOINT MACHINE CO.

WARREN, OHIO

(Continued from page 72)

starts work he is interviewed by the safety inspector who shows him the safe and unsafe ways to do his work, tells him whether he will be required to wear safety goggles or a kapok vest and where to obtain these articles if needed. The employee is also furnished a pamphlet covering the safety requirements on the particular work to which he has been assigned. He is then put to work by his foreman. His work is closely observed and he is given careful instructions on any points which he does not fully understand.

It will be understood from the above description of the operations of the Local Civil Service Board that all Civil Service appointees have had prior experience in the position to which appointed. However, even an experienced welder may never have used the type of welding machine or the kind of welding rods given him to use on his new job. To accustom appointees to the equipment which they are to operate and to the other special requirements of their new position, they are given at least one month in which to qualify. The probationary period in the Engineer Department at Large is not less than one month nor more than six months. If after a full and fair trial during this period the conduct or capacity of the probationer is not satisfactory, he is given a complete written statement of the reasons, and this notice terminates his service. Retention in the service after the 6-month probationary period makes the appointment absolute.

Wages and Hours

The project was started with funds provided under the National Industrial Recovery Act. The regulations promulgated under that Act established minimum wage rates for certain classes of workers. The minimum rate established in this zone for common laborers was 50c per hour; for carpenters, blacksmiths, machinists and journeymen in various other trades, it was $1.20 per hour. Rates for semi-skilled positions were set between these to correspond with the importance and responsibility of the position, the degree of training required and the prevailing wages in this vicinity. Clerks, engineers and other employees of similar grades were employed at rates established under the Classification Act. These rates start at $1,260 per annum for underclerks and at $2,000 for the engineering grades. Although funds were later provided under the Public Works Administration Act, the Emergency Relief Appropriation Act and the regular River and Harbor Appropriation Acts, no change has been made in the scale of wages. However, numerous promotions have been made.

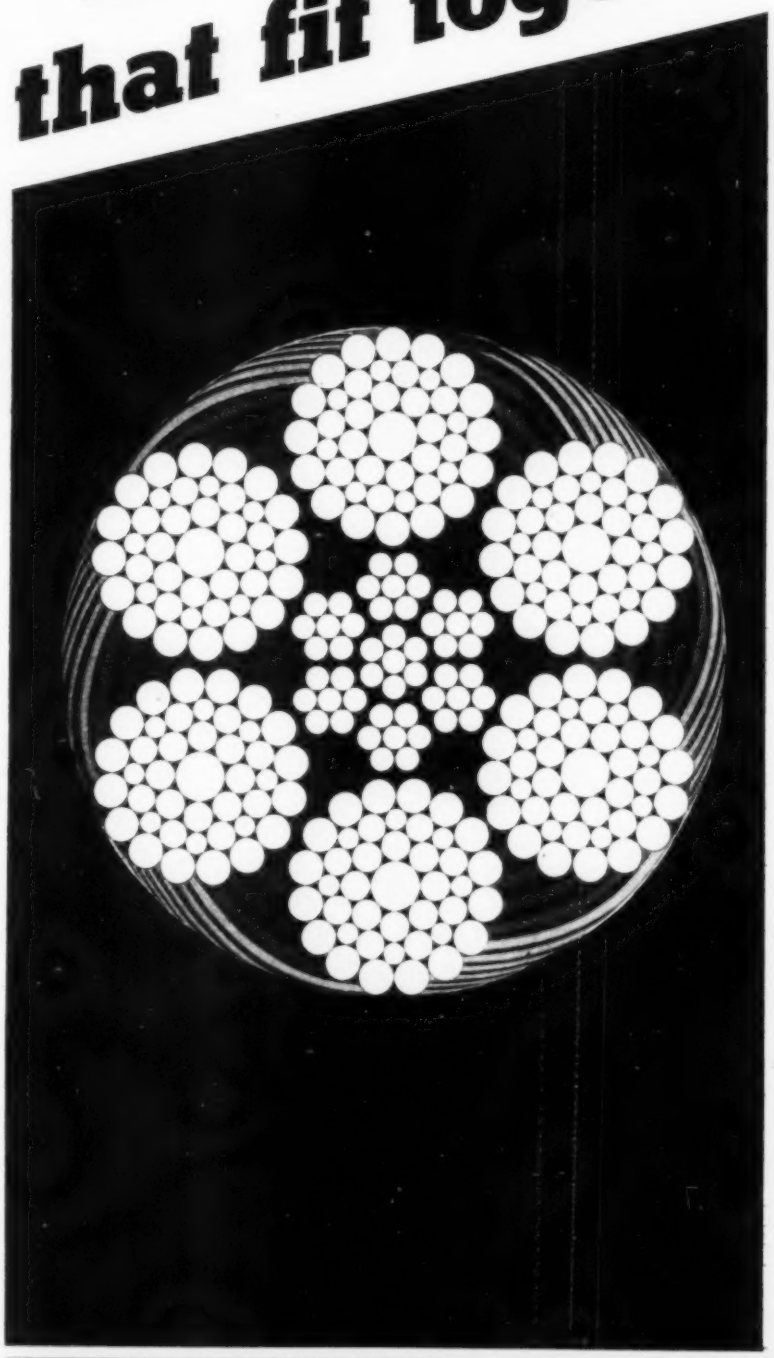
As to hours of service, all employees are divided into three general groups. The first group contains employees who are required to work 7 hours per day, 39 hours per week. This group includes office workers, professional, scientific and technical employees and sub-professional employees, who are employed principally in office or laboratory duty. The second group contains employees whose schedule is 8 hr. per day and 40 or 44 hr. per week, and includes professional, scientific and technical employees, custodial or maintenance employees, mechanical and crafts employees and laborers. This group is engaged principally on outdoor work. The third group contains employees whose schedule of hours is 8 per day with an average of 44 per week adjusted over a three-month period or

(Continued on page 76)

PURPLE-STRAND *FORM-SET* DREDGE ROPE

BETHLEHEM Specify FORM-SET PRE-FORMED ROPE

271 moving parts that fit together perfectly



HERE are the moving parts of a heavy-duty machine—a Purple-Strand Form-Set Dredge Rope, 6 x 37 construction, IWRC. There are 271 of these parts, and they must fit together perfectly within a cross-section exactly 1½ inches in diameter.

To design a rope of this type involved considerably more than merely fitting the required number of wires into a small space. Each outside wire must be solidly supported to avoid crushing on the drum. Each strand must be a tight yet flexible unit to withstand pressure and bending as it moves over sheaves. The center rope must be of the right lay and size to enable each strand to function properly as a part of the rope. And each of these factors must be tempered by a knowledge of probable drum and sheave sizes, operating loads, and running speeds of a dredge.

Bethlehem Purple-Strand-quality ropes are precision machines. Designs of various Purple-Strand lines have been worked out to the most minute detail. The quality of the steel is the finest our metallurgical and melting organizations can produce. Wire drawing is in the hands of wire-mill craftsmen who specialize in rope wire. Machines making Purple-Strand are operated by men of the highest skill. From the premium-priced steel to the final testing and inspection, nothing is overlooked to make Purple-Strand Form-Set Dredge Rope the finest money can buy.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

THE GREATEST VALUE FOR YOUR HOISTING ENGINE DOLLAR

The
AMERICAN
GENERAL PURPOSE
HOIST

SUPREME IN THE 20 TO 100 H. P. CLASS. SIMPLE, RUGGED, EASY TO OPERATE; NOT A POUND OF EXCESS WEIGHT.

A QUALITY HOIST AT A PRICE

Write Dept. C. M. for a copy of Bulletin 100-H-1.

American Hoist and Derrick Co.
Saint Paul, Minn.

AMERICAN TERRY DERRICK COMPANY
South Kearny, N. J.

Branch Offices
NEW YORK & CHICAGO

The Genuine
CROSBY CLIP

(Continued from page 74)

over a working season. This includes employees on floating plant, railroads and in hospitals. Practically all of the laborers and mechanics on the project come under the 8-hour law, and except in extreme emergency are prohibited from working more than 8 hours in any one calendar day.

When classified employees are no longer needed their availability is circularized throughout the Engineer Department with a view to placing them in other Engineer Districts. Many employees of this District have transferred to other Districts of this Department and to other Departments of the Government. Experienced clerks and engineers who have served here during most of the life of the project are especially in demand.

Medical Care

The District employs a highly skilled surgeon, two very capable physicians, an experienced dentist, nurses and technicians, and operates a fully equipped hospital to treat the sick and injured employees. As a part of their compensation all Government employees who are subsisted and quartered on the project are eligible for reasonable and necessary medical and hospital service for any illness which they may contract in the performance of their duties. Dental work of all kinds, the treatment of chronic ailments and diseases or injuries not traceable to the performance of duty are also available at nominal charges to the employee and his dependents who live in Government quarters.

These hospital facilities were established primarily for the treatment of employees injured in the performance of duty. In addition to the hospital facilities, first-aid stations have been established at strategic points throughout the project. Qualified attendants always are on duty at these stations. When an employee is injured on the job, no matter how minor the injury, he is required to go to the first-aid station and have the wound dressed. First-aid classes are held at regular periods.

When employees lose time because of injuries sustained in the performance of duty, they may be granted leave with full pay up to the amount of leave which they have earned or which may be given them under the regulations. When their leave credit is exhausted, the U. S. Employees' Compensation Commission pays them compensation equal to two-thirds of their monthly pay. This compensation is not less than $58.33 nor more than $116.66 per month. It begins after they have lost three days' pay and continues until they are able to return to duty.

In the case of the death of an employee resulting from injuries sustained while in the performance of duty, the U. S. Employees' Compensation Commission pays the funeral expenses, not exceeding $200, and compensation equal to a specified percentage of the deceased employee's pay, to his widow and minor children, and under certain conditions to dependent parents, brothers, sisters, grandparents or grandchildren. The wholly dependent widower of a deceased female employee may also be allowed compensation. The amount received as compensation by the widow of an employee who was receiving $100 per month at the time he sustained an injury in the performance of duty which resulted in his death would be $35 per month (35%). To this is added $10 per month (10%) for each child under 18 years of

(Continued on page 78)

"Old Faithful" that's what construction and maintenance men everywhere call their G & R self-priming centrifugal pumps. Fool proof because they're gadget-less. They've got something the others haven't—simplicity. They can't clog—they're not quitters.

The only pumps with renewable wearing plate — they're modern.

G & R's will deliver more water per hour and pump more hours at less cost — under any conditions.

WE WILL SHIP YOU ONE *and* LET YOU BE THE JUDGE!

You'll find them
THE MOST DEPENDABLE PUMPS FOR THE LEAST MONEY
...bar none

PROMPT DELIVERY ... from Stock in 100 Principal Cities

WRITE ↘ THE GORMAN-RUPP CO., Mansfield, Ohio

UNION for Profits

Size 3A Union Pile Hammers driving round wood piles for U. S. Dept. of Interior, National Park Service at Salem, Mass., Historical site.

Union Pile Hammers show profits because they are built to keep working and keep out of the repair shop. Their one-piece frame, absence of bolts to work loose, and central point lubrication are three reasons for superiority. For steam or compressed air; no change of parts. Backed by 30 years' experience in hammer building.

● **WRITE TODAY** for full details of Union Hammers, Buckets and other construction equipment.

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INTERNATIONAL
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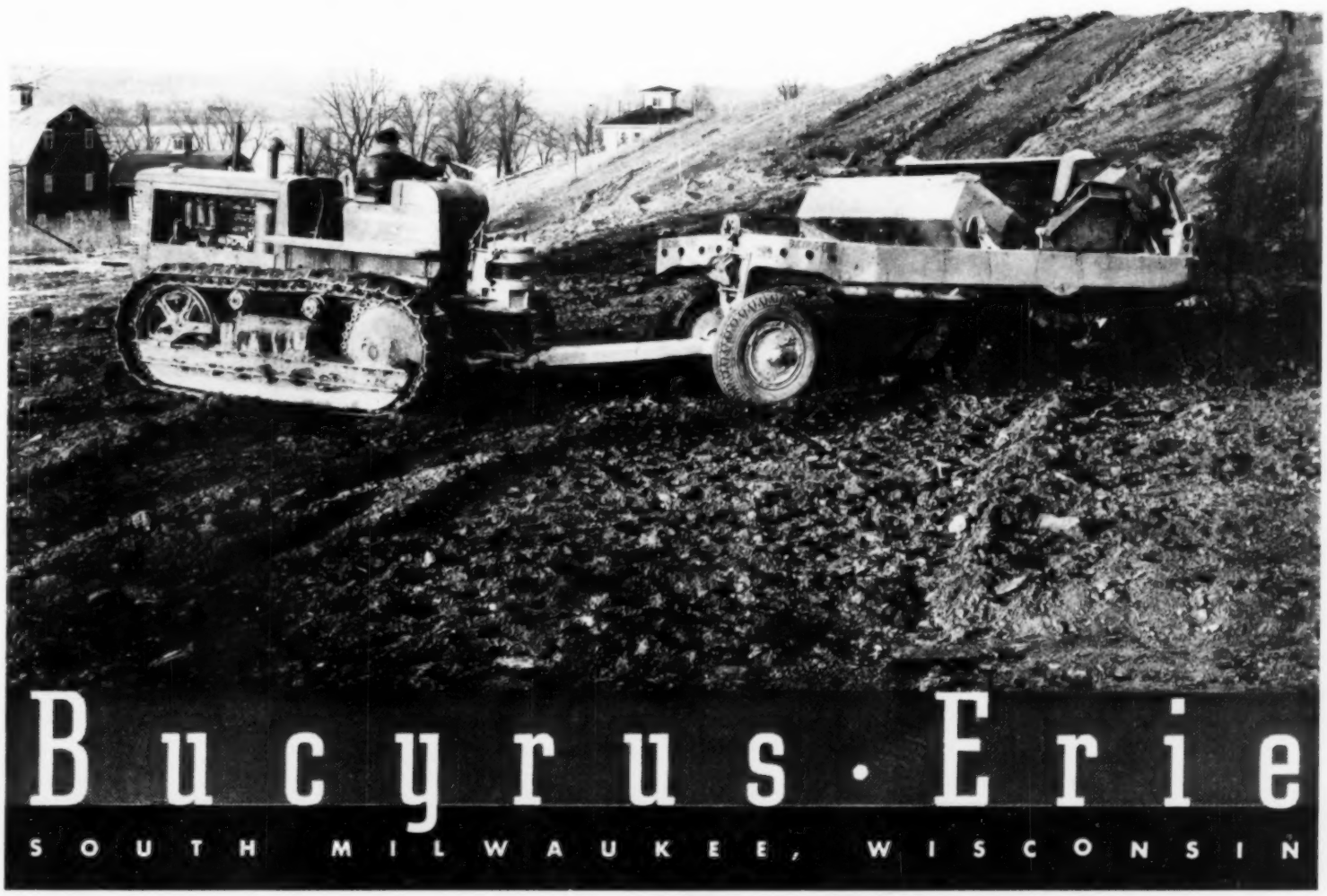
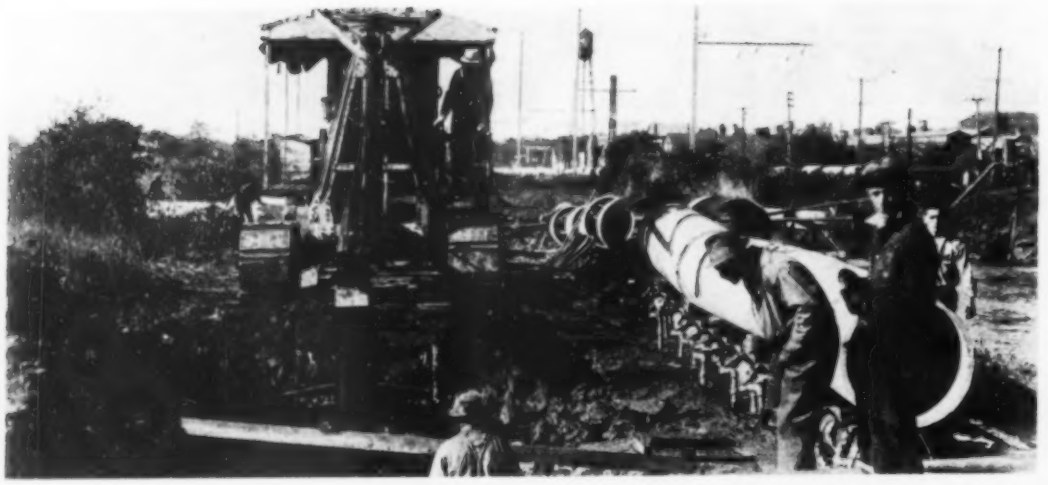
BUCYRUS · ERIE
M 81 4-Wheel Scraper
+
A perfect team
to give you lowest
cost dirt moving!





Thank You, Mr. Superintendent!

Twice a day flood tide eighteen inches deep over everything. Twice a day the Moretrench Wellpoint System dried things up again and work proceeded.

"As usual—Moretrench more than came up to our expectations."

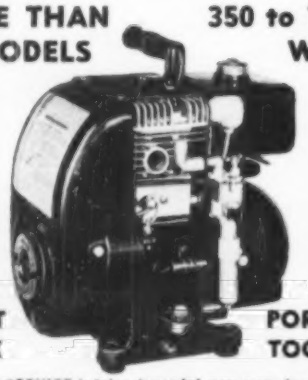
EXPERT, ECONOMICAL DEWATERING UNDER ANY CONDITION

MORETRENCH CORPORATION 90 WEST STREET NEW YORK CITY

ONAN ELECTRIC PLANTS
OPERATE
ELECTRIC TOOLS
ON
ALL JOBS

MORE THAN 40 MODELS — 350 to 10,000 WATTS

LIGHT for NIGHT WORK — POWER for PORTABLE TOOLS



ELECTRIC SERVICE is being demanded more every day by Contractors who must complete Jobs FASTER, SAFER and AT LOWER COST. THIS IS WHERE ONAN ELECTRIC PLANTS "STEP INTO THE PICTURE".

These COMPACT, LIGHT-WEIGHT, PORTABLE ELECTRIC PLANTS supply all the "Juice" needed for operating Electric Tools, such as DRILLS, SAWS, GRINDERS, SANDERS and for FLOOD LIGHTING on NIGHT JOBS.

PORTABLE MODELS are furnished with convenient handles so they can be carried anywhere. All Models can be supplied on pneumatic tired Dollies for still easier handling.

Two of the 40 standardized Models IDEAL FOR PORTABLE WORK are a 500 Watt, 115 Volt, DC Units (shown above), weight 71#, and a 1500 Watt, 115 Volt, DC Unit, weight 145#.

ONAN ELECTRIC PLANTS are HEAVY-DUTY, SUBSTANTIALLY BUILT, ECONOMICAL RUNNING UNITS and are built COMPLETELY IN OUR OWN PLANT. They are built "to take it" on Construction Jobs.

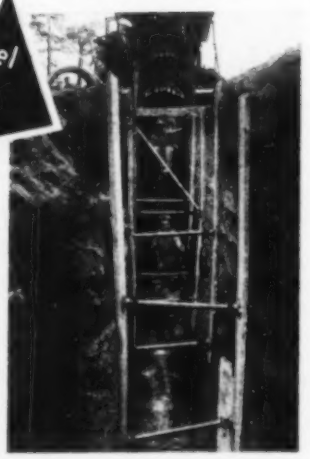
THOUSANDS in use ALL OVER THE WORLD. They are serving as STANDBY UNITS where Power Line Failure would create an Emergency. They are used on Farms, Homes, and Camps to operate LIGHTS, RADIOS and All Appliances. 110 or 220 Volt, AC — 12, 32 and 110 Volt, DC — and Dual Voltage AC-DC Types. Manual, Full Automatic or Self-Starting. Shipped COMPLETE, READY TO RUN. Prices $89 and up.

WRITE FOR DETAILS AND PRICES

D. W. ONAN & SONS
806 Royalston Ave. • Minneapolis, Minn.

End Costly Cave-Ins with SIMPLEX Trench and Timber Braces

Drop Forged Steel Makes Them Stronger, Safer



They quickly pay for themselves on a single job by eliminating cave-ins, run-outs and reducing accidents. They're stronger, will resist rough handling and greater stresses than ordinary malleable braces.

Ball and socket joint at both ends provide fast gripping at any angle. Handles have ball ends for safety. For trenches of any width — be on the safe side — use Simplex Trench and Timber Braces!

Form IND-38 lists all types and sizes. Sold by your supply house.

TEMPLETON, KENLY & CO.
Chicago

Better, Safer Construction Jacks Since 1899

SIMPLEX
GOLD MEDAL AWARD SAFETY JACKS

(Continued from page 76)

age. This compensation is paid to the widow until death or remarriage and to the children until they reach 18 years of age. The total monthly compensation to all beneficiaries cannot exceed 66 2/3 per cent of the monthly pay unless the monthly pay is less than $87.50. In no case will monthly compensation be paid which exceeds the monthly pay of the employee.

Every possible effort is made to prevent injuries. Safety committees, safety inspectors and safety posters are everywhere on the job. Frequent safety meetings are held. Safeguards are installed on all dangerous equipment. Worn or unsafe tools are discarded. Employees are required to wear safety hats when working in tunnels, cuts, quarries or where objects may fall on them from above. Safety shoes and safe clothing are recommended. Employees working in dust, near welding machines or on tools where there is any danger from flying chips are required to wear goggles, which are provided by the Government free of charge. Employees who work on floating plant and pipe lines over the water are required to wear kapok vests.

Living Conditions

Because of the isolated location of the project, it was necessary to provide quarters for a large proportion of the employees. Houses numbering 298 were built and rented to key employees who moved their families to the project. These houses are not expensively constructed but they are warm, modern and are all equipped with baths, gas and electricity. An employees' hotel was constructed in which the key employees without families reside. One hundred and sixty-three barrack buildings were provided for other employees without families. With each group of barrack buildings a mess hall and two bath houses were constructed. These buildings were completely filled during the peak of the construction period. Later not all of the barracks were needed for employees without families and they were partitioned off into apartments and rented to employees with families. These apartments provided quarters for 482 families.

The food served in the Government mess halls has always been of excellent quality, suitable variety and ample quantity. The work is carried on 24 hr. per day. It is necessary to provide meals for employees before they go on and after they come off shift and to pack a lunch for them to eat in the middle of their shift. No restrictions have been placed on the number of meals an employee may eat during a day. After he comes off shift he may eat at every meal served until he goes on shift again if he so desires. Very few take undue advantage of this privilege.

Every employee on the project is automatically a member of the Recreation Association. No dues are charged. This association is a non-pofit organization; it leases the recreation hall and the theatre building from the Government and operates all recreation facilities of the reservation. The athletic facilities are open to all employees and their families without charge. Six tennis courts are provided. During the early construction period a nominal charge was made for the use of these courts but they are now open for use without charge. Tennis and horse-shoe pitching tournaments are held and a regular inter-project league plays soft ball games almost every afternoon during the soft ball season.

The employees here have made homes of their houses and apartments. Beautiful lawns, flowers

(Continued on page 80)

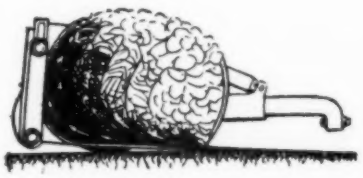
Easier Loading AT A FLAT DIGGING ANGLE

with the outstanding new

BAKER HYDRAULIC SCRAPERS

It's a proven fact, not mere theory, that Baker Hydraulic Scrapers load easier, with less power, because they dig at a flat angle. On job after job, contractors and road officials are reporting greater yardages at costs which are, in many cases, considerably under those obtained by the use of scrapers of much larger capacity.

Such features as automatic rear clearance, tapered pan, down pressure on cutting blade and smooth hydraulic control all contribute to efficient dirt moving. Baker Scrapers not only dump cleanly but spread evenly. Instead of gouging out holes they make smooth cuts because the digging angle is practically constant regardless of the depth of cut.



Baker Scrapers dig at a flat angle, loading the rear end first . . . thus requiring less power to load to capacity.

Baker Scrapers are built in sizes for use with 20 horse-power tractors up. Write for latest Bulletins on Scrapers, Bulldozers and other Baker equipment.

THE BAKER MFG. CO.

568 Stanford Ave.,

SPRINGFIELD, ILLINOIS

Baker Bulldozers & Gradebuilders

On jobs where speed, dependability and economy are vital, you're sure to find Baker hydraulic equipment. Below, Baker Bulldozer, on Allis-Chalmers SO Tractor, on 6,000,000 yard airport job at Buffalo, N. Y.

• BAKER TRACTOR EQUIPMENT •

BULLDOZERS • GRADEBUILDERS • SCRAPERS • ROOTERS • ROAD DISCS • MAINTAINERS • SNOW PLOWS

Increase Your Yardage with an INSLEY

The unusual flexibility and mobility of the rugged ½ and ⅜ yard Insley Excavators enable them to be kept working all the time and accounts for their ability to do a heavier day's work than many machines of larger rated capacity. As a result these smaller excavators have proved, in a wide variety of operations that total yardage per day is not dependent upon bucket capacity alone.

INSLEY

TODAY'S ALL-PURPOSE WORK HAT

M·S·A SKULLGARDS

On every type of work, they're wearing Skullgards now! Because Skullgards are light, easy-fitting—comfortable as any old felt working hat,—with these extra values built-in: high fracture resisting strength; insulation against electric shock; complete immunity to softening from water, perspiration or oil. Skullgards give real head protection, not only from falling objects, but from all the painful bumps a man may suffer at any time on any job. 8 different styles. Send for Bulletin DK-6 . . . and let us arrange a demonstration for you!

TODAY'S ALL-AROUND WELDING PROTECTION

M·S·A COMBINATION SKULLGARD-WELDING SHIELD

Now . . . Skullgard's proven head protection and comfort is incorporated with the regular protection of a better welding shield! This two-fold safety has been achieved in an ingenious design offering greater comfort and increased welding efficiency on every construction job; the cap-type Skullgard may easily and quickly be removed from the welding shield and worn separately for other work when desired—the easy-tilting welding shield is the latest one-piece type with leakproof lens holder. For complete details on this long-needed assembly, write for Bulletin No. CE-6!

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS & MEADE STREETS PITTSBURGH, PA.
District Representatives in Principal Cities

(Continued from page 78)

and gardens thrive where only sagebrush grew a few years ago. A neighborly spirit prevails throughout the town. Now that the work is nearing completion close friends and good neighbors are scattering to the four winds. Many of them no doubt will work together again but never on a construction job more interesting or more enjoyable than the Fort Peck Project.

Safety IN TUNNEL CONSTRUCTION

(Continued from page 50)

reduced greatly by using wet drills for dust control and proper ventilating equipment for removal of smoke and fumes. Chest X-rays of all men working in rock tunnels are good insurance for the employer and a safeguard for the employee. Respirators should be worn by workmen on concrete mixing crews and on other operations where there is a dust hazard.

The storing, transportation and use of explosives present hazards which demand that every precaution be taken. Only experienced and licensed men are permitted to transport and use explosives. Specially built cushioned boxes and cars are used to transport dynamite and detonators from the magazine to the working space. All electric current is shut off in the heading and only permissible miners' electric cap lamps are used by men charging holes. Electric blasting switches, a safe distance from the heading, are locked in "off" position, except when in use. All the unused explosives are, of course, immediately returned to the magazine.

Ventilation After Blasting

Employees should not be permitted to return to the working space after a blast until the smoke and fumes have definitely cleared and complete inspection for mis-fire is made by the blaster and foreman. Ventilation after blasting is essential, from a safety standpoint as well as an efficiency standpoint. Ventilation is a simple matter under air pressure. A bleeder pipe which has a hand-valve control near the heading and extends from the tunnel through to the earth's surface, has proved efficient in quickly removing the smoke and fumes. A large funnel is attached to the pipe intake, and a canvas curtain covering the top part of the tunnel is hung directly behind the pipe. Exhaust blowers set on the form carriers and piped through to the earth's surface are used for smoke removal when blasting in free air.

When it is necessary to weld or burn in the

(Continued on page 82)

STANDS ALONE
AS THE LEADER IN
POWER!

The Strongest Pulling Trucks are GMC's

General Motors Trucks outpull all others. This means faster pick-up and quicker movement of your goods than is possible with any other truck operating under the same conditions! Valve-in-head engines, always 10%-20% more efficient, show still greater power and economy results in GMC's all-new SUPER-DUTY engines.

—and GMC's Save More on Gas, too

Case records of thousands of 1939 GMC'S in service prove *astounding* savings on gas and oil! "Our new GMC 228 engines save us 26 gallons per unit on our trips from Toledo to Buffalo—a saving of 40%!"—"The new GMC is 15% more saving on fuel than the lowest priced trucks." Innumerable statements like these PROVE GMC's unbeatable economy! Let your GMC dealer further prove it on one of your runs!

Our Own YMAC Time Payment Plan assures you of lowest available rates

ONLY GMC offers all this:

- 7 ALL-NEW VALVE-IN-HEAD ENGINES
- 10 NEW DIESELS—3½ ton range and up
- NEW APPEARANCE—Created by General Motors Styling Division
- NEW LIGHT-DUTY CABS with V-type windshields
- NEW BODIES—bigger, sturdier and improved in construction
- NEW C. O. E. MODELS—1½ to 8 tons
- SYNCRO-MESH SHIFTING on Heavy-Duty GMC's

CAPACITIES, ½ TO 15 TONS

• THE TRUCK OF VALUE •

GMC TRUCKS TRAILERS - DIESELS

WILLIAMS Buckets

CAN TAKE IT and DISH IT OUT

That's why Williams Buckets are profit producers. Can they take it! Man, they're built to tear into the heaviest, toughest, roughest digging. Williams Buckets stand up for years under most gruelling service. And can they dish it out! Just watch a Williams Bucket come up with a full capacity bite, and dump the load swiftly and cleanly . . . then swing back ready to wade into action again. Yes sir, Williams Buckets are truly

BUILT TO LAST . . .
and MOVE DIRT FAST!

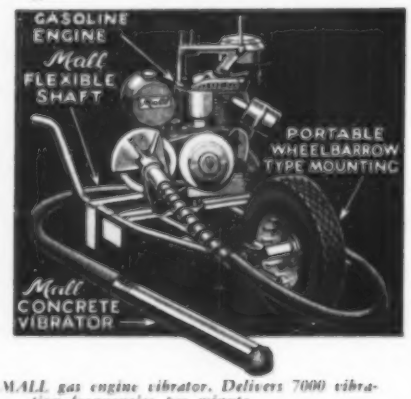
. . . and if that's what you want in a bucket, you'll find your particular type in the Williams Catalog. It's free!

THE WELLMAN ENGINEERING CO.
7017 Central Ave., Cleveland, Ohio

Send for Catalog. Distributors located in all parts of the Country represent the Williams Line of Power-Arm, Multiple Rope, Power-Wheel, Single Line, Hook-On and Dragline Buckets.

built by WELLMAN

BIGGER PROFITS! BETTER CONCRETE! WITH Mall CONCRETE VIBRATORS



MALL gas engine vibrator. Delivers 7000 vibration frequencies per minute.

With MALL vibrators on the job, you eliminate expensive hand spading, get greater strength, density and uniformity. You also effect greater economies through the use of coarser aggregate and less cement.

The same MALL power unit can be used for SURFACING, SAWING, SANDING, DRILLING and PUMPING to help you get the biggest dividends from your equipment investment.

MALL TOOL COMPANY
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They *Must* Be Good To Be So Widely Used!

"DIXON"

AIR HAMMER COUPLINGS

For Every Rock Drill and Hand Hammer Job

The performance record of these couplings leaves no doubt as to their dependability and economy. Made to fit all makes of rock drills and hand hammers, they withstand the incessant vibration of the drill without danger of blowing off, or permitting loss of power through leakage. Simple construction — strong and durable — cadmium plated to prevent rust.

Available in two styles — WLD-7 (compact type) in ½" and ¼"; WHD-9 (heavy type) in ¼" and 1".

Carried in stock by leading rubber manufacturers and jobbers

DIXON
VALVE & COUPLING CO.
MAIN OFFICE AND FACTORY
PHILADELPHIA, PA.
Branches: Birmingham-Los Angeles-Houston

(Continued from page 80)

tunnels, tests for combustible gases should be made just before the torches are lit; and while the burning is in progress tests should be made at regular intervals for carbon monoxide gas. Welders, of course, should wear goggles, shields and gloves, and should have a water pump type fire extinguisher at hand. Screens should be used when arc welding is done to protect fellow workmen from the harmful glare.

Tunnel Transportation

Storage battery locomotives used for transporting materials in tunnels should be equipped with heavy steel bumper plates, and draw bars should be used between the dinkey and cars when raw materials such as rails, pipes and planking are transported. Operators and brakemen should have police whistles to use for signals and for warning workmen walking along the track. Operators must be instructed to keep their dinkey headlights burning whenever trains are in motion, and not to move a dinkey when they are coupling cars without a signal from the brakemen. Spring switches which eliminate a great deal of switch throwing, red warning lights placed on all low scaffolds, and specially built cars with seats to convey men in and out of the tunnel are requisites for safety on tunneling operations.

Hoist cables, slings, safety dogs on cages and brakes on electric dinkeys and trucks must be inspected at regular intervals by the mechanical and safety department.

Practical guards should be used on all flywheels and all types of power-driven saws, shapers, belts and conveyor chains. Accidents caused by unguarded or unsafe mechanical equipment are usually serious. Scaffold and ladders must be carefully inspected at regular intervals and safety shoes and steel points must be used on ladders. Safety belts should be used by men working on scaffolds, in shafts, caissons and wherever hand rails are impractical.

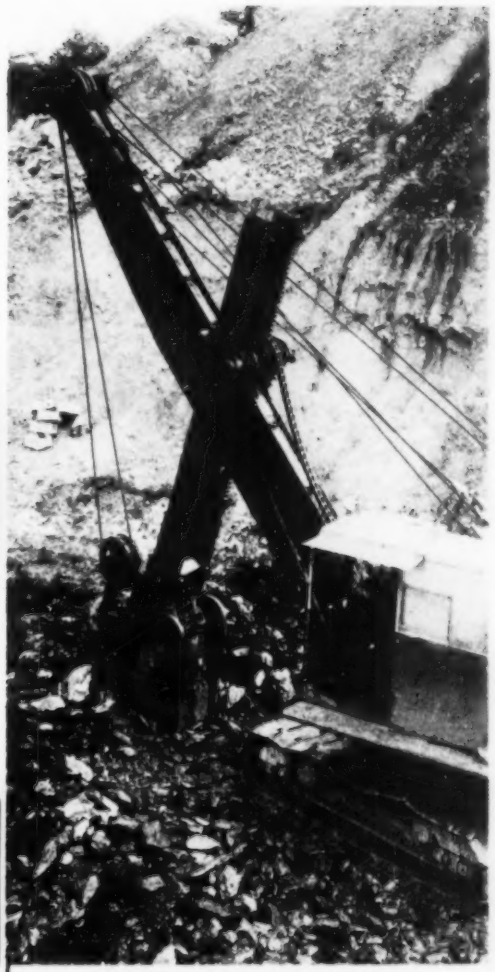
Tunnels should be kept clean and orderly and properly illuminated *always*. Disorder and inadequate illumination not only breed accidents, but leave the impression with workmen that their company's safety teachings are not sincere. There is a direct relationship between an orderly job and accident prevention. A well kept job with well disciplined workmen discourages accidents, but a poorly organized job and careless housekeeping encourage accidents.

Fire Hazards

Tunneling requires special safety equipment because of the possibility of fire, with its production of noxious gases and the inflow of poisonous, suffocating, or explosive gases from other sources, particularly from leaks in gas mains. Approved safety equipment consists of five sets of 2-hr. self contained oxygen breathing apparatus, combustible gas indicators, carbon monoxide and hydrogen sulphide gas detectors, flame safety lamps and self-rescuers (small emergency gas masks) which provide protection against carbon monoxide and other toxic gases. Rescue crews of 7 men on each shift must be given a minimum of one hour of training each week in use and care of oxygen breathing apparatus. Gas tests should be made in the working space at regular intervals, self rescuers must be provided for each man in the tunnel, and all men must be properly instructed in their use.

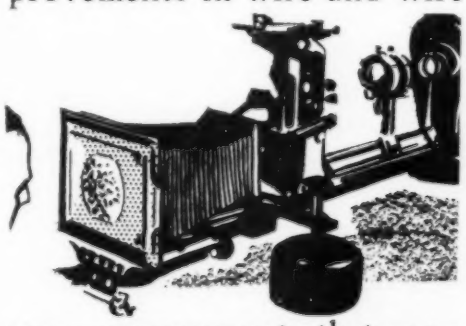
(Continued on page 84)

"You Needn't Worry About *this wire rope* ...Its Already Proved Itself on the Job!"



LABORATORY TESTED

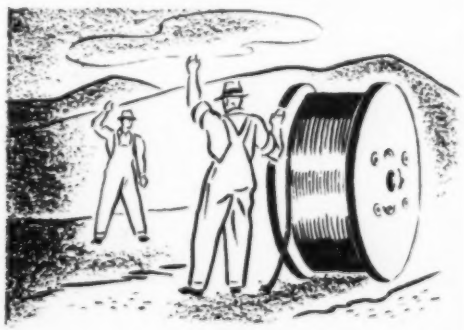
One thing always impresses visitors at the Macwhyte mills. It's the continuous laboratory testing and checking of materials. These tests lead to constant improvements in wire and wire



rope—improvements that mean *savings for you* on the job.

FIELD PROVED

The laboratory works hand in hand with field engineers who



are constantly proving, improving, and perfecting ropes on the job. Together they give you the correct wire rope for *your* job.

"Quality, not Tonnage," Macwhyte's aim! Only the finest materials are ever used. Skilled craftsmen supervise every operation. FROM ROD TO REEL, MACWHYTE IS MADE TO MAKE GOOD.

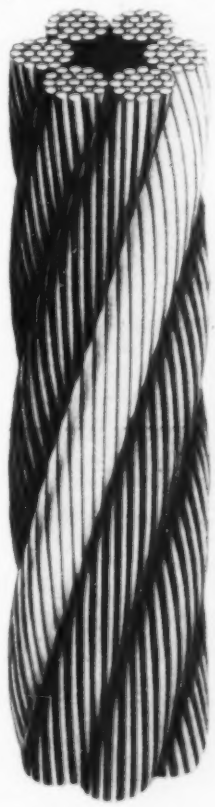
MACWHYTE

Whyte Strand - PREformed

THE WIRE ROPE WITH THE INTERNAL LUBRICATION
LABORATORY TESTED — FIELD PROVED

IMPORTANT TO YOU

Macwhyte Shovel Ropes are "going to town" on jobs all over the country. When the going is rough and tough they do their best work. Why? Because Macwhyte ropes are specially designed, "custom built," for your particular type of equipment.



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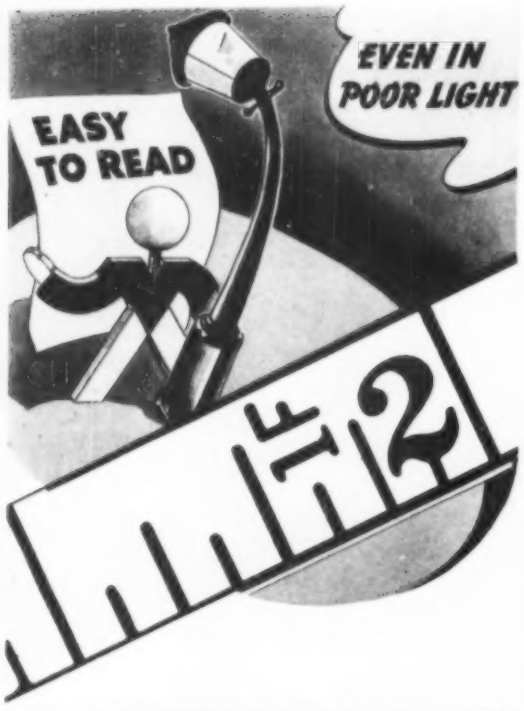
MONARCH WHYTE STRAND PREformed and Internally Lubricated

Macwhyte ropes are "custom built" for your job, that's why they are economical wire ropes. They're MADE TO MAKE GOOD (and make money, too) on YOUR JOB! Write us for prices and service records today!

MACWHYTE COMPANY · Manufacturers of Wire Rope and Braided Wire Rope Slings

Home Office: KENOSHA, WISCONSIN · New York... Pittsburgh...Chicago...Ft. Worth...Portland...Seattle... San Francisco...(Distributors throughout the U. S. A.)



THIS NEW STEEL TAPE IS

different!

Black markings on a white surface—strong, sharp contrast! Here is the most sensible steel measuring tape ever made. Easy to read—less chance for error—even in poor light. Saves time! Favorite Wyteface is hard to kink, hard to curl—good for a long useful life. The crack-proof white surface—easy to clean—is bonded to the steel, protects it against rust and corrosion . . . This new popular-priced model is available in 25, 50, 75 and 100 ft. lengths; sold by building material and hardware dealers. Mail the coupon for illustrated folder and complete prices.

EST. 1867

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K&E FAVORITE WYTEFACE STEEL MEASURING TAPES

LOOK FOR THIS DISPLAY

KEUFFEL & ESSER CO., Dept. 60 Hoboken, N.J.
Send folder and prices on Favorite Wyteface.
Name .....
Address .....

(Continued from page 82)

Three Serious Accidents

In my tunnel experience I have investigated three outstanding accidents:

(1.) On one of the rock jobs in Chicago the workmen drilled into dynamite which was used for blasting rock from the face of the tunnel and which had not exploded when the charge was set off. Three men were killed and a number severely injured. These deaths were directly traceable to lack of proper investigation after the charge was exploded.

(2.) On another job under the Des Plaines River two men were killed and others injured when workmen exploded some hand grenades which apparently had been tossed into the river from the bridge, had become covered with mud and silt, and had created no hazard until disturbed by the workmen excavating for the extension of a sewer across the river. This accident was the most peculiar one I have observed in construction work because the cause of the accident was entirely outside of the contractor's control. The grenades had undoubtedly been buried at that particular point for a number of years.

(3.) The third serious accident I have investigated occurred in Detroit where 5 men were instantly killed and several injured when a bulkhead gave way and released the compressed air from the tunnel. The men who were killed were either pulled through the shield opening by the rush of air or were dashed against the shield face. This catastrophe was caused by a weak bulkhead. To give you some idea of the force of the air suddenly exhausted from this tunnel, approximately one-half mile away a workman was pointing up the brickwork in a manhole and the sudden rush of air from the tunnel threw him up to the surface and held him suspended, half in and half out of the man-hole opening until a fellow employee reached over and pulled him to safety by his coat.

Safety Organization and Education

Accident prevention in construction is a problem of organization and education. Contractors have begun to realize, more and more, that they are paying out millions of dollars annually in accident bills. This means waste and reduction of productive capital. Realizing this, contractors are beginning to take safety precautions to prevent unnecessary deaths and injuries. Accident prevention is a mixture of theory, science and hardheaded, practical, common sense. There may be such a thing as overdoing safety work in construction, but somewhere there is a happy medium between theory and apathy. Accident prevention in the construction industry is very largely a matter of education, vigilance and cooperation. Except for mechanical safeguards, which prevent a surprisingly small percentage of accidents, it is a matter of human relations rather than an engineering problem.

There is no construction organization too large or too small to enter into an active accident prevention program. An efficient program must start at the top The executive must do his part by putting accident prevention on the map, making it a necessary part of the process, and by getting back of it and keeping back of it so actively that every foreman will know just exactly what the company proposes to do to help make its jobs safe.

98% *of your questions* answered *in these two books*

***By* G. UNDERWOOD**

Estimating Construction Costs

630 pages, 6 x 9, 443 charts, 36 illustrations, flexible, $6.00

THIS book provides a simple chart system that gives construction costs at a glance and takes long and tedious headwork out of estimating. Over 400 of the charts are given in ready form for handy use, and cover the estimating of transportation, labor and material costs for all kinds of construction work. The book also presents a complete model estimate for a typical small building, together with a step-by-step description of the methods followed in making it.

CONTENTS: 1. Transportation of Materials. 2. Handling Materials. 3. Excavation. 4. Piling. 5. Concrete. 6. Wood Construction. 7. Brick, Tile and Stone. 8. Structural Steel. 9. Lathing and Plastering. 10. Roofing, Flashing and Waterproofing. 11. Pipework and Heating. 12. Plumbing. 13. Electrical. 14. Painting and Glazing. 15. Machinery and Machinery Erection. 16. Overhead. 17. Estimating. 18. Prices of Material.

Standard Construction Methods

SECOND EDITION

490 pages, 6 x 9, 422 illustrations, flexible Keratol, $5.00

HERE is a manual of actual construction methods — methods that are used every day by practical engineers, superintendents and others upon whom rests the responsibility of getting things done. It covers construction methods thoroughly — from first steps in organization and equipment to pipe work and painting — from excavation and pile driving to roofing and plastering.

CONTENTS: 1. Organization and Equipment. 2. Excavation. 3. Pile Driving. 4. Concrete Construction. 5. Wood Construction. 6. Brick and Stone Construction. 7. Steel Construction. 8. Roofing and Flashing. 9. Lathing and Plastering. 10. Scaffolds and Material Towers. 11. Erection and Rigging. 12. Pipework. 13. Painting. 14. Construction Schedules.

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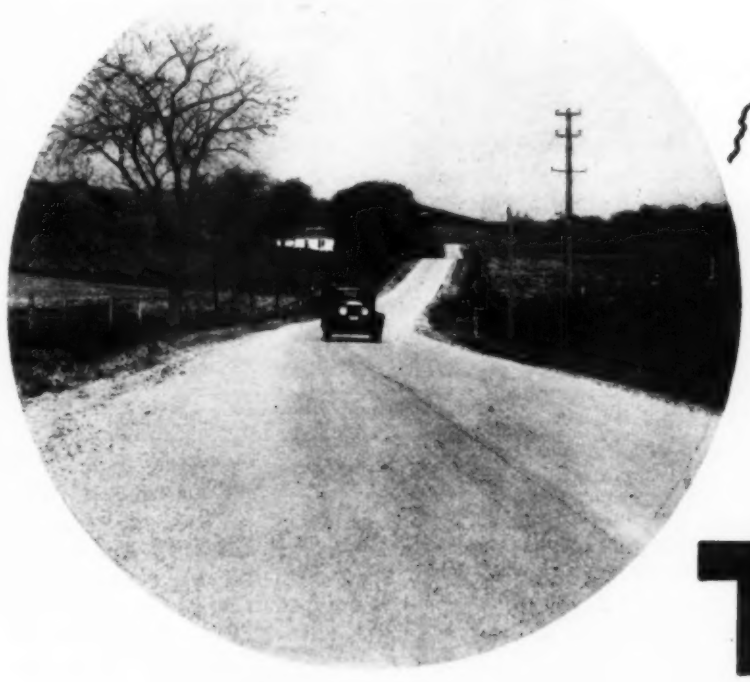
ENOUGH ASPHALT FOR A FAIR-TO-FAIR HIGHWAY



The tonnage of TEXACO Asphalt used in the United States last year would pave a 30-foot wide highway from the World's Fair in New York City to the Golden Gate Exposition in San Francisco. These cities are more than 3,000 miles apart.

TEXACO

asphalt

THE TEXAS COMPANY **Asphalt Sales Department** **135 E 42nd St., New York City**

Chicago Cleveland Kansas City Philadelphia Houston Jacksonville Buffalo Richmond Boston

OUTSTANDING!
-in digging ability and durability

Owen Buckets

No other bucket approaches the Owen Bucket in its ability to take "a mouthful at every bite" and serve for extra long periods with freedom from adjustments and repairs.

Write for catalog explaining the exclusive features that make this outstanding performance possible.

***The* Owen Bucket Co.** 1020 Breakwater Avenue Cleveland, Ohio
Branches: New York Philadelphia Chicago Berkeley, Cal.

THERMOID SUCTION HOSE

***For* LONGEST LIFE ON TOUGHEST SERVICE**

It's the record of performance on a given product that turns in the final verdict on the "cost" of the product.

That's why Thermoid Suction Hose leads the field as the most economical suction hose you can buy.

Illustrated is a length of Thermoid Suction Hose that has already turned in a man-sized job, pumping out footers for a re-inforced concrete bridge. You can take the operator's word for it . . . its life has just begun.

Thermoid Suction Hose is furnished in varying diameters in lengths up to 50 feet. It is available in smooth bore for severe service with water containing sand, grit and other abrasive materials . . . and in rough bore for conveying non-abrasive materials such as gas, water and other liquids.

THERMOID RUBBER
Division of Thermoid Company
TRENTON, N. J.

Thermoid
FLAT AND V BELTS • HOSE • PACKINGS • BRAKE LININGS

"Area Maintenance" *On Virginia Secondary Roads*

Continued from page 58

nance and construction. For the fiscal year starting July 1, 1937, Pittsylvania County received $85,000 for ordinary maintenance of secondary roads and $107,000 for construction and improvements, a total of $192,000. In the current fiscal year, starting July 1, 1938, the sum received from the state for secondary roads will amount to $220,000, and federal aid for the same highways will amount to $28,000, providing a total of $248,000. More extensive construction and betterments will be possible with the larger sum.

Road Improvements — Accompanying photographs show construction work performed by area maintenance crews in preparation for later bituminous surface treatment by one of three surface-treating outfits operating in the Lynchburg district of the State Department of Highways. Since taking over the county roads in 1932, the state organization in the county has surface-treated about 40 mi. a year, except in the season following the hard winter of 1935-36, when all maintenance funds were needed for repairs. In all, the maintenance funds have taken care of surface treatment of about 200 mi. and retreatment of 85 mi. Location of surface-treated roads and of probable surface-treatment work for the next five years is shown on the accompanying map. The general purpose of the program is to connect primary routes, all of which are hard-surfaced, with surface-treated secondary roads that carry the largest volume of traffic, — that is, the most important farm-to-market roads.

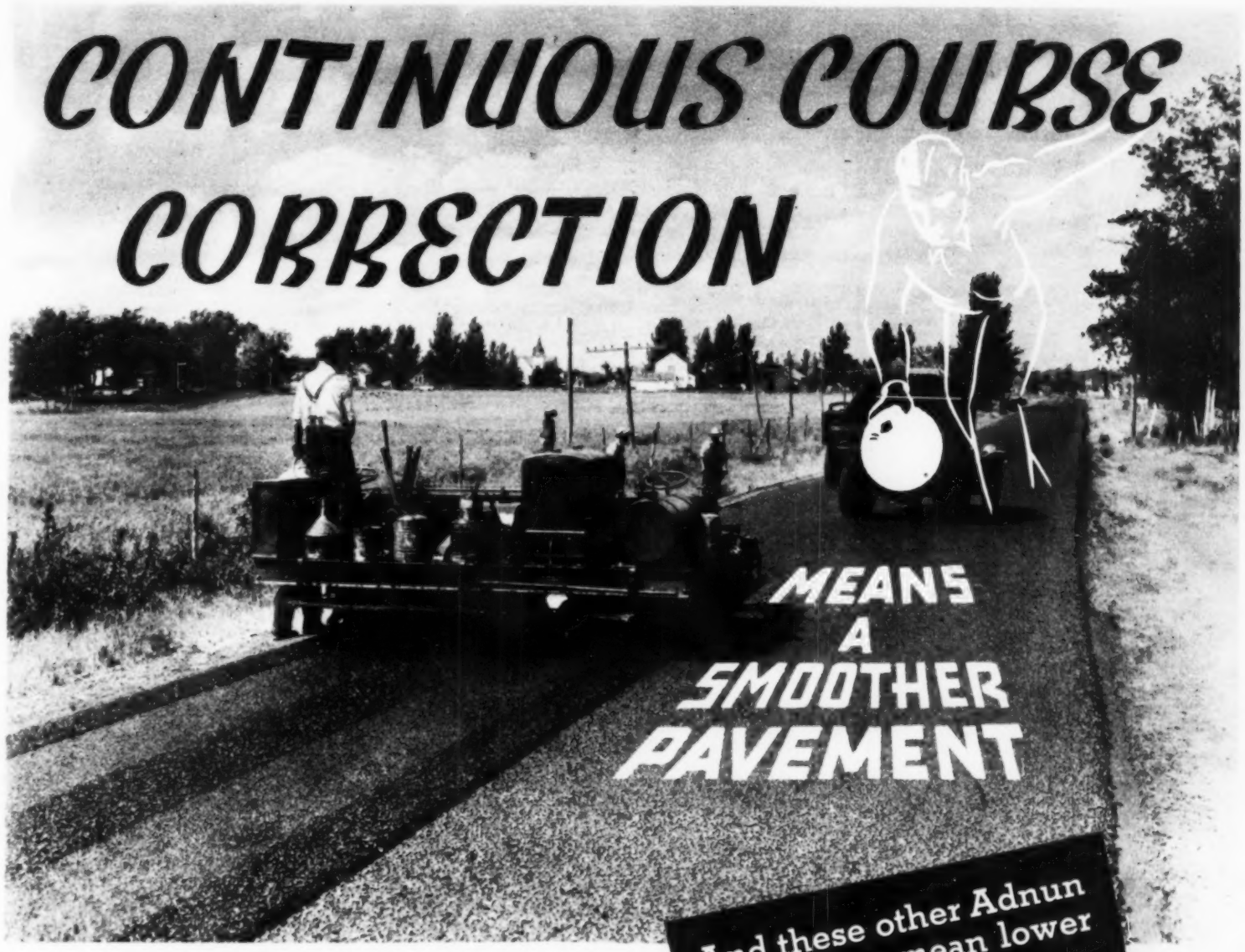
As recognized by engineers of the State Department of Highways, bituminous surface-treated roads are highly desirable for many reasons, but because of their cost it will be many years before all secondary roads can be treated. An average cost per mile for original treatment, exclusive of conditioning, is $1,000, which gives an annual cost spread of $333 if the treatment lasts 3 years. Thereafter the road requires retreatment about every 4 years at a cost of $800, or an average annual cost of $200. These figures do not include regular maintenance charges, which must be added to them.

Secondary roads are built up with the county's natural topsoil — gray, gritty earth containing fine binder material. Except where excess sand is present, the soil when compacted and maintained makes a stable, hard, permanent roadway for light traffic. After receiving light bituminous surface treatment, the all-year usefulness and ease of maintenance of these highways are excellent.

Preliminary Construction — Grading, draining and roadway widening are completed, if possible, a year before surface treatment is applied. Tractors and heavy blade graders make grade changes and widen the roadway section. Earth hauling is avoided, as the maintenance crews have no equipment for loading trucks.

(Continued on page 88)

CONTINUOUS COURSE CORRECTION



DO you know what Continuous Course Correction is? Continuous Course Correction is the ability to correct surface irregularities with each successive course of material. This is an Adnun feature—an advantage that Adnun brings you over all other types of black top pavers—a direct result of riding on the finished course—an advantage that means a *smoothness of pavement that other methods can not equal.*

This can be proved to your satisfaction either with straight edge or periminometer tests.

For real black top smoothness, make it an Adnun job!

THE FOOTE COMPANY, INC.
NUNDA • NEW YORK

And these other Adnun advantages mean lower cost pavement.

- *Sturdy construction that endures hard service.*
- *The power cut off—no tag end runouts.*
- *Power to handle the heaviest truck.*
- *Hydraulic controls.*
- *Overlapping action Cutter Bar—makes a perfect joint under pressure.*
- *Full adjustment for bank and wedge courses.*
- *Capacity to over 1000 tons a day.*

ADNUN

TRADE MARK REGISTERED

BLACK TOP PAVER

MULTIFOOTE CONCRETE PAVERS AND ADNUN SPREADERS

(Continued from page 86)

To condition a road for surface treatment, the state organization in the county has a seven-blade maintainer with lengthened wheelbase, for use in leveling the road, and two 600-gal. gravity-flow watering tanks which are mounted on rented trucks when needed. Two portable centrifugal pumps are taken along to fill the tanks from creeks. During the conditioning, soil is added to the road wherever the existing soil course has worn to less than 6-in. depth.

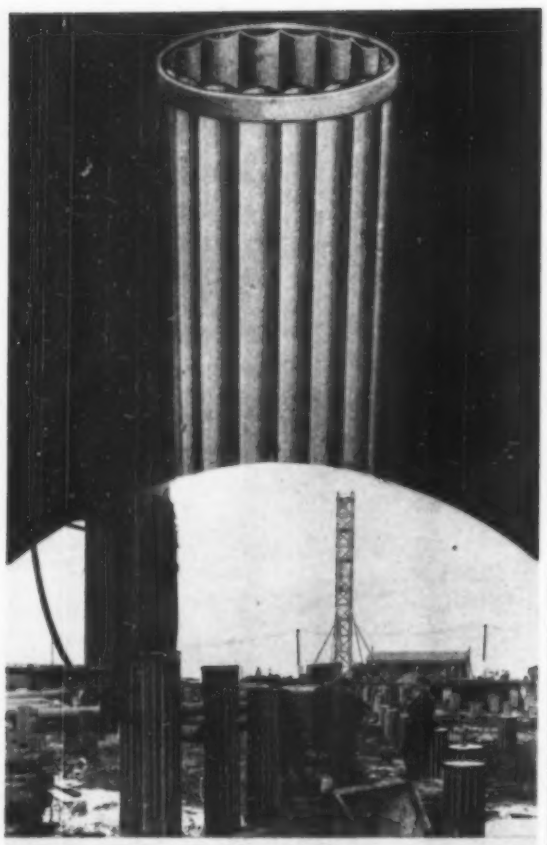
Surface Treatment — Actual surface treatment is put on by a district outfit using either a state highway distributor or a rented distributor. The work of the district outfit is charged against the county's construction fund for secondary roads. Typical surface treatment operations are indicated by accompanying photographs.

An ordinary surface treatment takes ⅔ gal. of cold bituminous material, placed in two applications, and about 40 lb. of stone per square yard. The cost, including grading, drainage, and rebuilding an existing road with additional soil, amounts to $1,700 or $1,800 per mile. Retreatment of surface-treated road calls for ¼ gal. of cold bituminous material and about 20 lb. of stone. The stone used in both cases is local bank-run sand and gravel, delivered at a cost of about $1 per yard.

Equipment Yards — Each maintenance area has an equipment yard of about 1 acre inclosed in a wire fence and furnished with bolted buildings which can readily be dismantled and re-assembled in case it is necessary to move to another location. The buildings include a small office, a large truck shed for four trucks, a smaller shed for the pick-up truck and a shed for tools, grease, oil and paint. Occasionally a primary patrol keeps its equipment in the same lot.

All material to be used by primary patrols is delivered to destinations on or along the highways by the area maintenance trucks. When necessary, especially in cases of emergency, the area maintenance crews can be used on primary highway work. In all such cases, the cost is charged to the primary allocation for the county.

Administration — Area maintenance in Pittsylvania County got its start under the direction of W. W. Nichols, resident engineer in charge until July 1, 1938, when periodic departmental transfers caused him to be replaced by E. M. Wickre. The experiment was initiated and carried out under close observation by administrative officials of the State Department of Highways: H. G. Shirley, commissioner; C. S. Mullen, chief engineer; and J. J. Forrer, maintenance engineer. In the Lynchburg district, K. G. McWane is district engineer.



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● A tough pile that drives without core or mandrel—that's the Fluted Steel Monotube. Its heavy, fluted steel wall has all the strength and rigidity required for hard driving. Faster driving is a certainty because none of the hammer's force is dissipated driving useless weight.

Remember, too, that the Fluted Monotube pile costs less to handle, offers the combined structural strength of steel and concrete, and is easily inspected after installation.

All of these advantages are described in detail in Union Metal Catalog No. 68. Write for it today.

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THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

CONSTRUCTION EQUIPMENT NEWS

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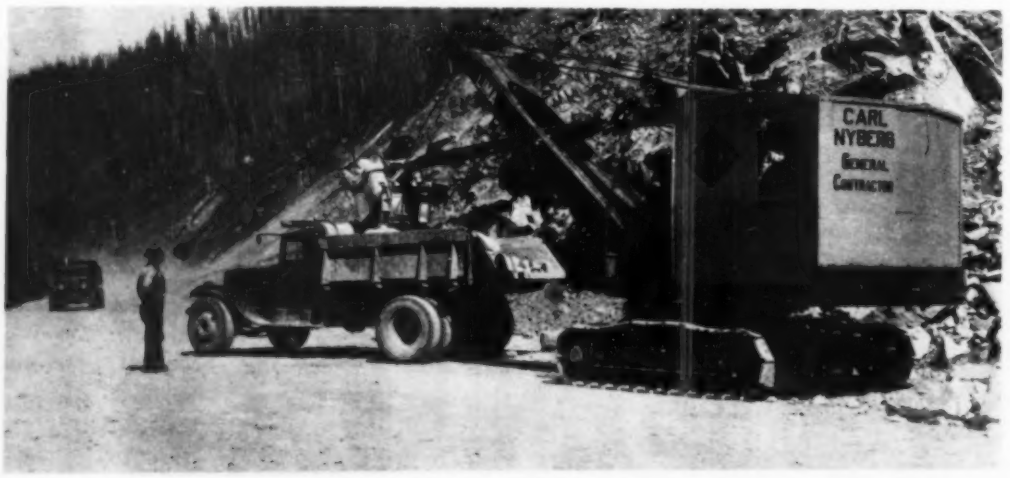
Review of Construction Machinery and Materials for MARCH, 1939



CONVERTIBLE SHOVEL. dragline, crane and pull-shovel known as "Paymaster" is a ¾-yd. machine weighing 35,500 lb., said to be exceptionally fast and to possess ample strength for steady, dependable service. As shovel it is equipped with 18-ft. boom and 15-ft. dipper handle. Standard crane boom, 35 ft. with additional inserts extends it to 50 ft., when needed. Features: (1) Greater lifting capacity obtained by placing main machinery to rear of revolving frame; (2) all control levers placed within cab; (3) anti-friction bearings; (4) rotating base is one-piece casting; (5) internal expanding band-type main clutches; (6) double-cone, friction type swing and travel clutches; (7) welded construction; (8) 22-in.-wide crawler treads (30-in. treads optional); (9) independent boom hoist; (10) streamlined cab. — **Lima Locomotive Works, Inc., Lima, Ohio.**

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THE ACCIDENTAL FALLING . . . of an apple in an orchard started the chain of thought which led Sir Isaac Newton to propound his Law of Universal Gravity.

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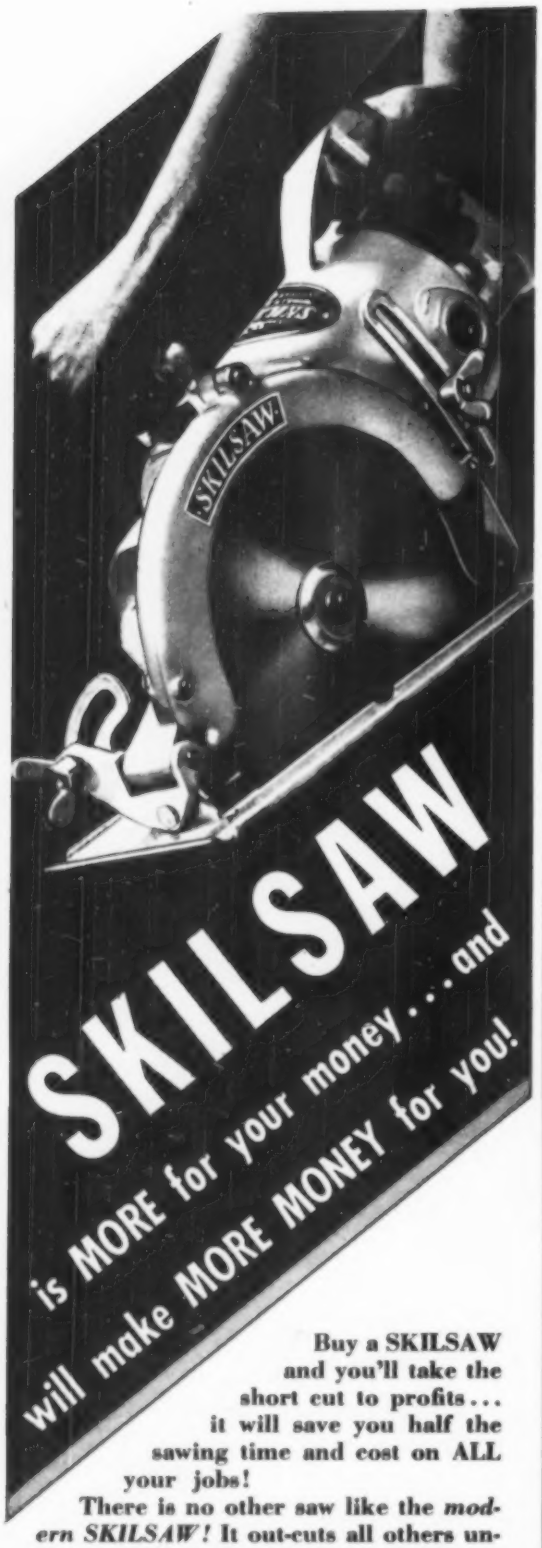

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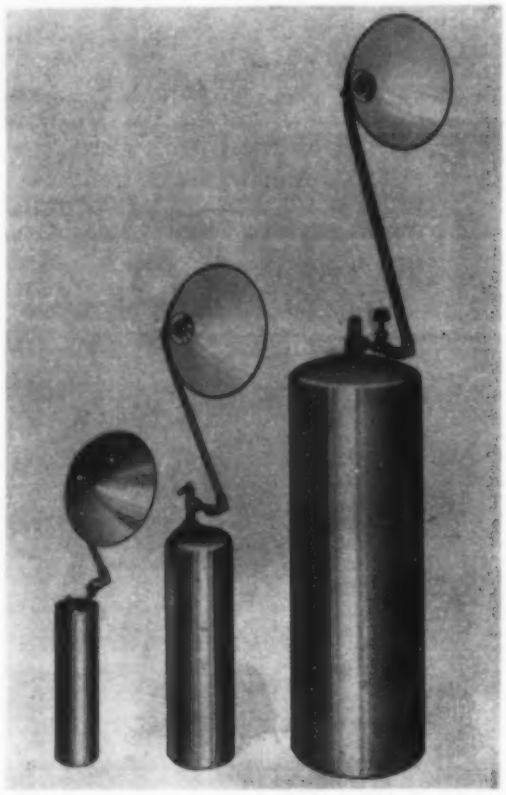
PORTABLE ACETYLENE FLARE LIGHTS designed for use by contractors, railroads, street railways and all industries working outdoors at night. Supplied in three sizes: No. 10T for use with 10-cu.ft. acetylene tanks has 10-in. aluminum reflector, tank connection, swing joint and stand pipe; height of attachment, 12 in. to center of burner; overall height, including



tank, 30 in. No. 40T for use with 40-cu.ft. acetylene tanks is equipped with 13-in. aluminum or porcelain reflector, tank connection, swing joint or stand pipe; height of attachment, 18 in. to center of burner; overall height, including tank, 40 in. No. 150T for use with standard 150-cu.ft. or larger acetylene tanks, is equipped with 13 in. aluminum or porcelain reflector, tank connection, swing joint, gas cutoff cock and standpipe; height of attachment to center of burner, 28 in.; overall height when used with standard 150-cu.ft. acetylene tank, 66 in. — **The Alexander Milburn Co., 1416-1428 W. Baltimore St., Baltimore, Md.**

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Each one of the volumes in this set is a complete handbook on some important subject. Sturdily bound and pocket size, it will go right "on the job" with you for immediate consultation.

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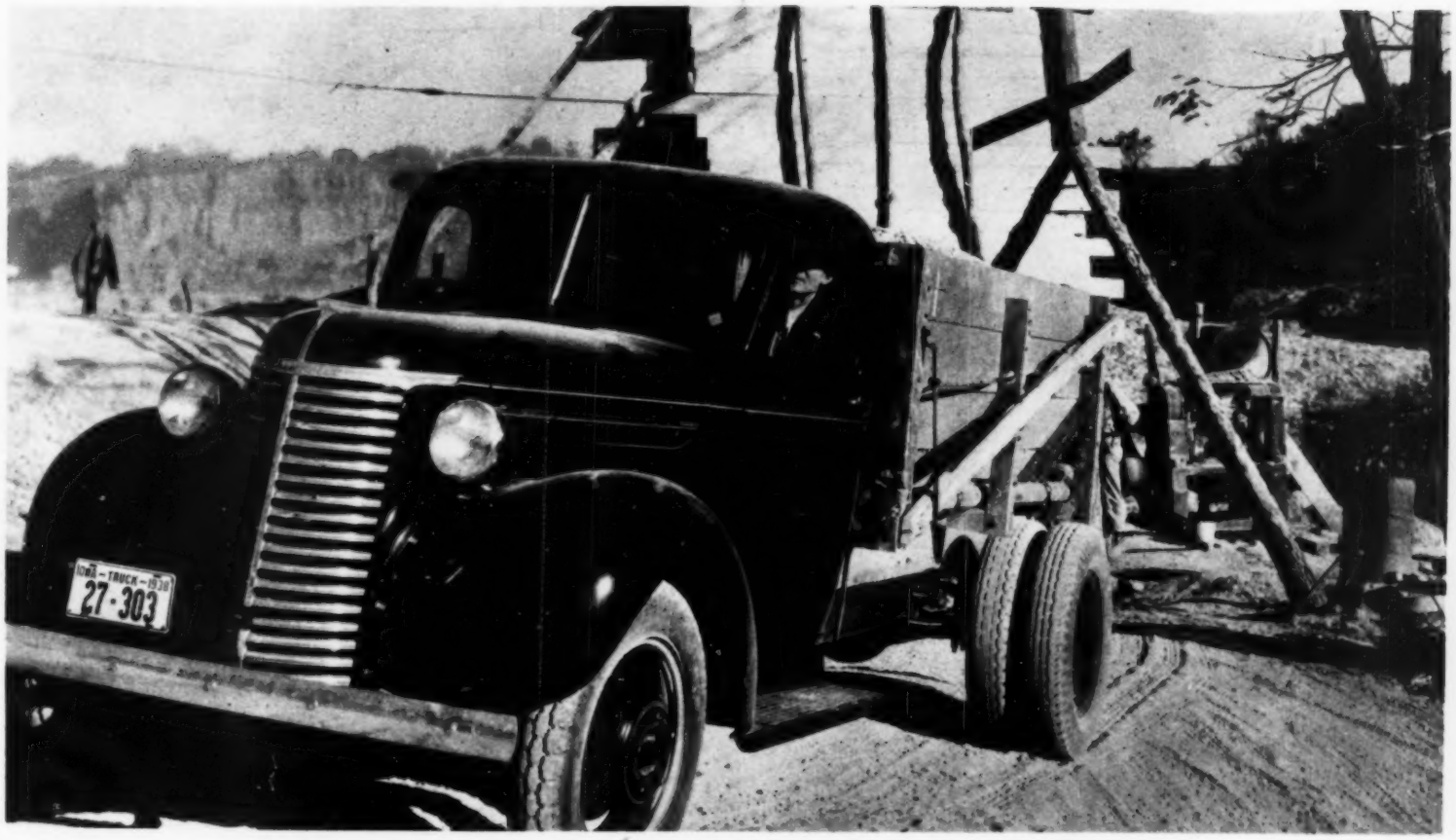

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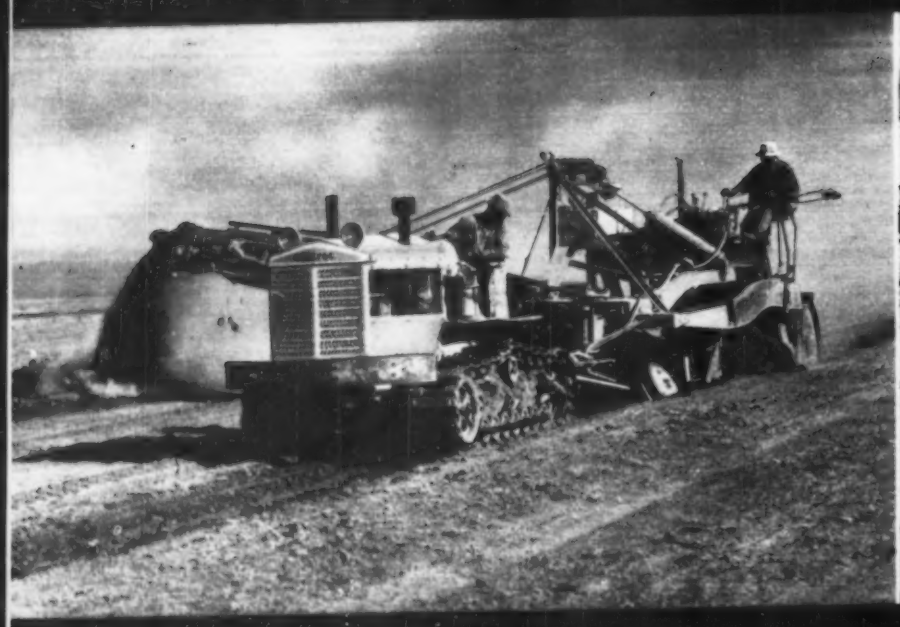

Where soil conditions permit, Cletracs and elevating graders will handle unusually large yardage. The quantity of dirt ahead of the disc illustrates Cletrac's power.

There's no whipping nor jerking of this grader from side thrust because Cletrac's Controlled Differential Steering permits the operator to follow a true, straight course.

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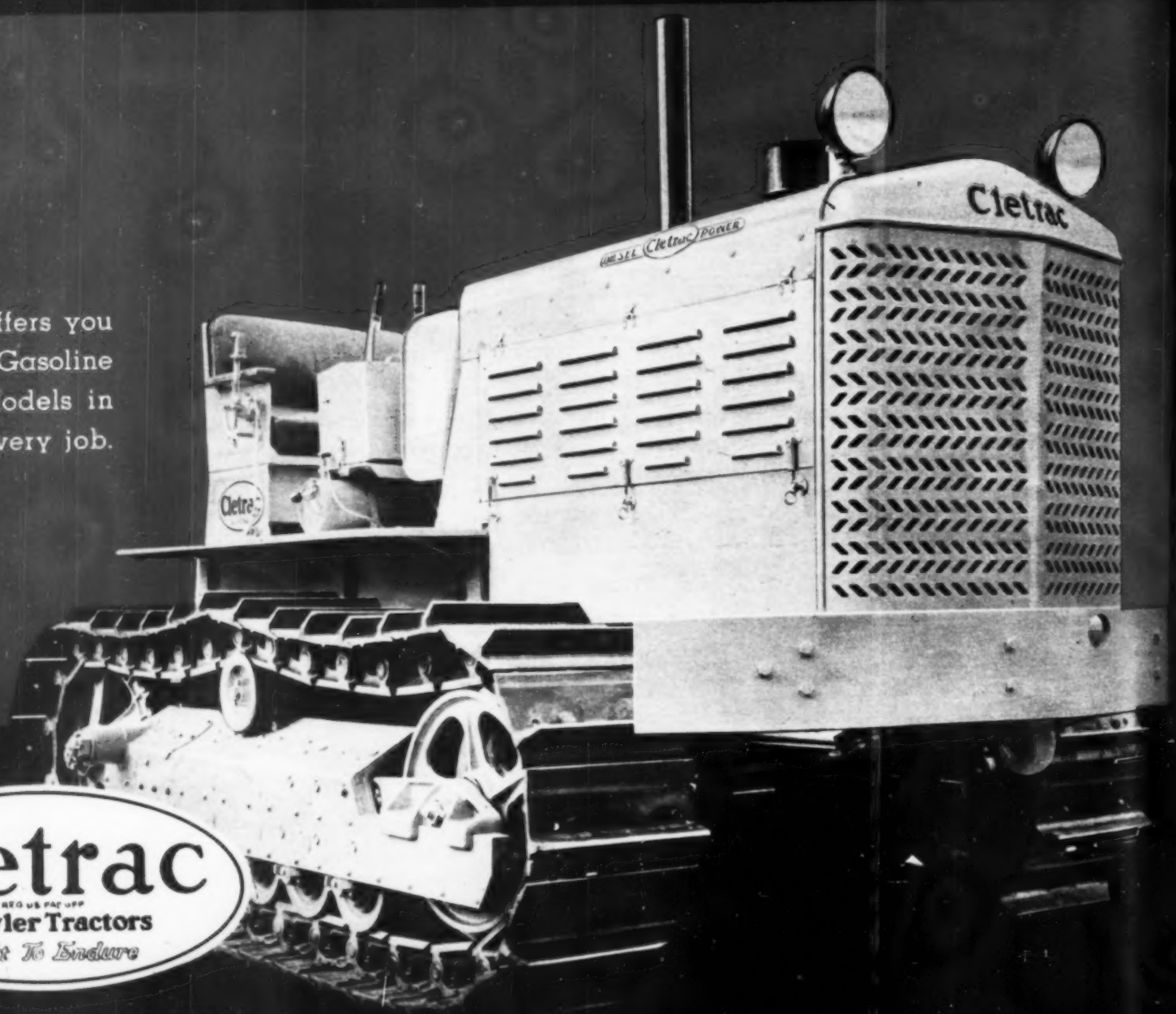

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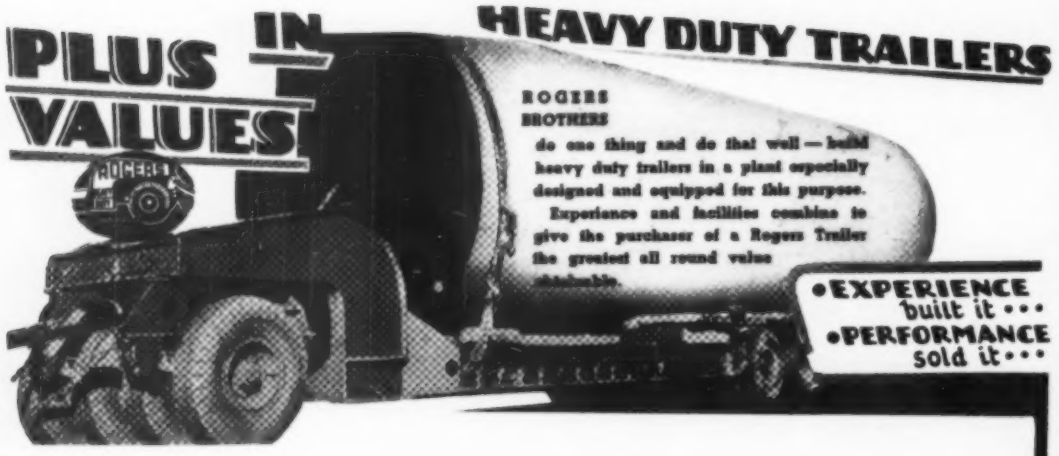
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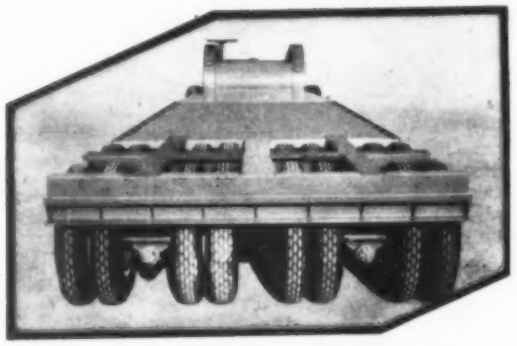

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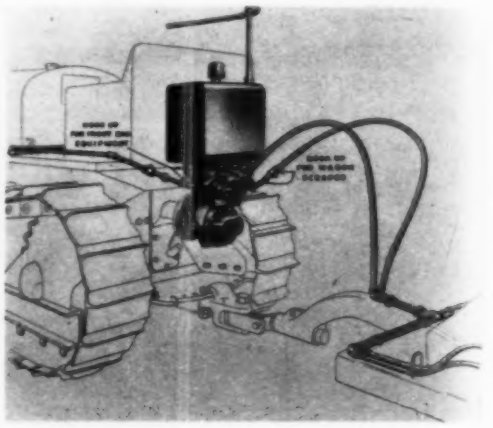

ment such as bulldozers, angle blades, loaders and shovels. Tractors operating front-end equipment also can be used to pull wagon scrapers by opening or closing a single valve, according to type of equipment to be used. Pump on Be-Ge power control unit, which is connected to tractor rear power take-off, is simple and foolproof and provides high volume delivery of pressure. Pump unit operates at zero pressure when not under load. Valve control has spring loaded neutral return, operating easily because of hydraulic balance. Turning control lever easy as turning a faucet. — **Continental Roll & Steel Foundry Co., East Chicago, Ind.**

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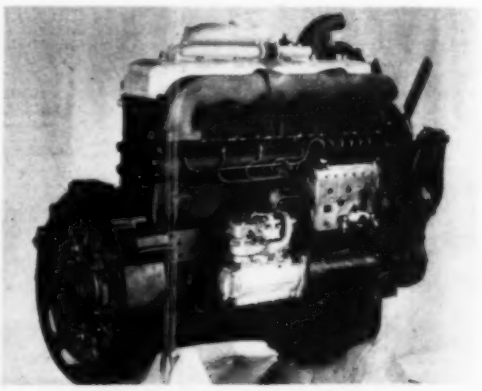

energy cell combustion system, said to provide highest practicable power per cubic inch with minimum peak pressures, bearing loads, fuel pressure and compression. Other advantages of this system: Smoothness, responsiveness, flexibility, ability to idle well and low fuel consumption. Clogging difficulties eliminated, as system employs single large-nozzle, self-cleaning, pintle-type jet rather than numerous microscopic open jets. Besides advantages of Lanova system, mechanical design of engine has added simplicity, steadiness of running, dependability and durability. — **Mack Trucks, Inc., 34th St. & 49th Ave., Long Island City, N. Y.**

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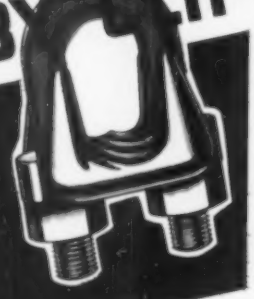

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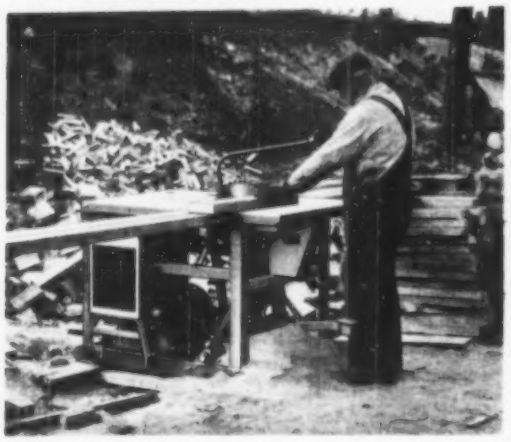

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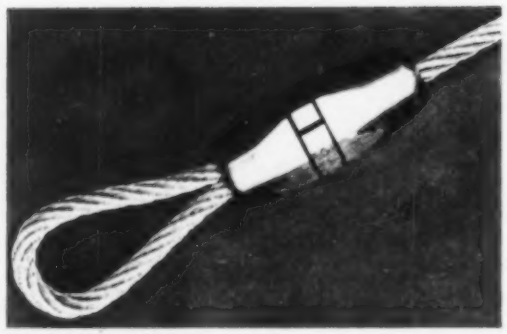

WIRE ROPE CLAMP said by its manufacturer to eliminate splicing and serving and to develop full strength of plow steel cable. Made of rust-proof manganese bronze. — **Marine Specialty Co., 3178 Bellevue Ave., Detroit, Mich.**

ARMOR GRIDS for use in constructing floors of industrial buildings, driveways, traffic aisles, ramps, and platforms, are cast in sections 2 ft. by 1 ft. 10 in., of special gray iron containing moisture and

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PORTABLE ELECTRIC SANDING MACHINE, called "Electric Gyro Sander" is said to have unique movement of sanding pad which closely simulates hand sanding of craftsmen, produces high cutting speed and uniform finish and eliminates chasing and graining effects. Of value for heavy production jobs, yet flexible enough for lightest work. Replaces hand sanding on new or refinishing work, sands out un-

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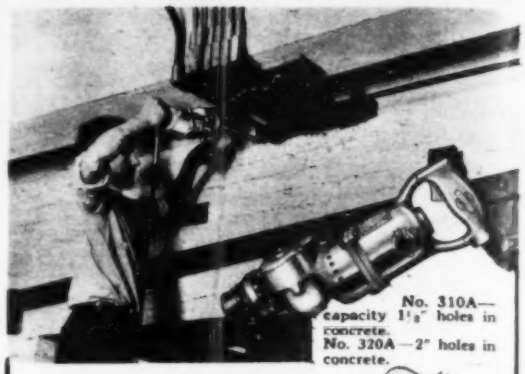

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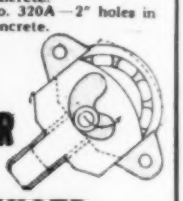

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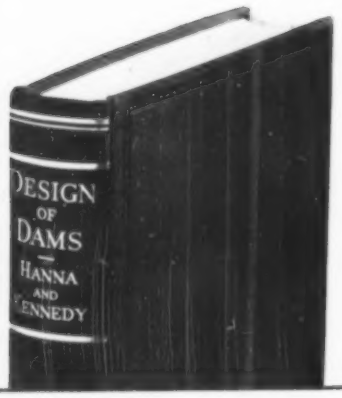

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NEWS FROM MANUFACTURERS *About Their Products*

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

MATERIAL HANDLING HAND TRUCKS — **Smith Devices.** 2245 N. 12th St., Philadelphia, Pa.) 6-p. folder, illustrated.) Various models of two and three-wheel hand trucks, equipped with hand and foot controlled brakes, for handling packages or loads of different shapes and sizes. Types include warehouse trucks, rail push cars, mine cars and trucks for handling drums, barrels, crates, steel castings, cable reels, etc. Also a wide selection of tong and sling grips adaptable to loads of every kind.

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ELECTRIC WELDING PROCEDURE—**Lincoln Electric Co.,** 12818 Coit Road, Cleveland, Ohio. (36 pp., illustrated.) Procedures for producing all types of welds in mild steel, for welding all metals used to any extent industrially and for applying surfacing metal to meet any type of wear-action in service, are covered in this new booklet. Subject matter includes: Recommended current ranges and arc voltages; suggestions regarding arc length, polarity of welding current, distance to hold electrode from work, cleaning beads, welding up or down, use of wide and narrow beads, peening to increase hardness, quenching, weaving the electrode, etc. Properties of welds produced in various metals are given and typical welding applications are illustrated.

• • •

ROCK CRUSHERS — **Gruendler Crusher and Pulverizer Co.,** 2917 N. Market St., St. Louis, Mo. (4-p. folder, illustrated.) Unit of hammer type named "2 in 1" has crushing range from 2½in. down to dust. Types include stationary, semi-portable. and portable. Flexible adjustment of size of crushed material is made possible by single part patented grate bars, which can be removed or inserted, as required. Photographs illustrate typical installations.

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INDICATING INSTRUMENTS — **Brown Instrument Co.,** Wayne and Roberts Aves., Philadelphia, Pa. (Folder, illustrated.) Covers complete line of indicating, recording and controlling instruments for measuring and controlling temperatures, pressures, flows, liquid levels and humidity. Typical installations are illustrated to show how instrument investments have been repaid by reclaimed losses.

• • •

ENGINE LUBRICATION — **Shell Petroleum Corp.,** St. Louis, Mo.(52 pp., illustrated..) Entitled "Panorama Lubrication" this booklet presents in interesting text description and illustration, understandable by the non-technical reader, the fundamentals of automotive engine lubrication. Discusses grades and kinds of oil, bearing failures, frequency of changing oil, sludge and the automotive engine as an oil-consuming device. The text deals with motor oil in terms of the destructive forces which shorten its useful life, explains how motor oil lubricates, and comments on the human element and its effect on both motor and oil.

• • •

DIESEL POWER — **Cleveland Tractor Co.,** Cleveland, Ohio. (14 pp., illustrated.) Explains, with diagrams, how diesel engine differs from gas engine in getting fuel into combustion chamber and igniting it. Forced turbulence of fuel in spherical combustion chamber created by air under pressure. Details of fuel injection system, with 6-cylinder pump producing pressure of 1,600 to 2,100 lb. per square inch. Clean fuel assured by seven filter units. Economies of diesel engine. Cletrac diesels have electric starters.

PORTABLE ELECTRIC TOOLS — **Black & Decker Mfg. Co.,** Towson, Md. (56 pp., illustrated.) Improvements in design and construction have been incorporated into many of the familiar portable electric tool units in the line, and a number of new tools have been added to conform with the company's policy of keeping abreast of market requirements. Three new units make their appearance for the first time in this catalog: The new 3/16-in. Hornet drill is the smallest and lightest weight production drill ever offered on the American market; the 5/16-in. ball-bearing utility drill, and the No. 36 portable electric hammer, both new units. These three new tools, together with the Holgun and Scrugun and other tools announced during the year, give a complete and up-to-date line.

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TRACTOR DESIGN FEATURES—**Cleveland Tractor Co.,** Cleveland, Ohio. (35 pp., illustrated.) Each component part of Cletrac tractor is "spot-lighted and the elements of each group, from engine to drawbar, are illustrated and analyzed. Detailed descriptions of controlled differential steering principle, electrical equipment and devices for sealing against dust. For the tractor owner or operator this booklet presents an informative "anatomical" study of the machine, part by part. Cut-away illustrations, with each part properly labeled, make clear the functions of all mechanical parts and their relation to one another.

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FLEXIBLE METAL HOSE AND TUBING— **Flexible Metal Hose and Tubing Institute,** 150 Broadway, New York, N. Y. (19 pp., illustrated.) New booklet entitled "The Fact Book of Flexible Metal Hose and Tubing" presents complete factual story of these important products while graphically portraying their usefulness in meeting many of industry's design, construction and maintenance problems. Illustrated with photographs of actual uses and installations, this booklet also lists and illustrates principal types and forms of flexible metal hose and tubing for the information of design engineers and users. Covers problems involving the handling of steam, gases, hot or cold liquids and certain solid or semi-solid materials.

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WROUGHT IRON PIPE AND FLAT ROLLED PRODUCTS — **A. M. Byers Co.,** Pittsburgh, Pa. (55 pp., illustrated.) General catalog provides complete mechanical information on Byers' genuine wrought iron and steel products, manufactured since 1864. Standard specifications, dimensions, weights and other essential information are given in tabular form for welded wrought iron and steel tubular products and for wrought iron flat rolled products. Describes physical properties of wrought iron, its corrosion resistant properties and weldability. General notes cover mill standards and pipe measurements with instructions on how to order tubular products. Complete index adds to reference value of this publication.

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HOIST AND CRANE MOTORS—**Westinghouse Electric & Manufacturing Co.,** East Pittsburgh, Pa. (4-p. leaflet, illustrated.) Hoist and crane motors, designed to meet exacting electrical and mechanical requirements of severe reversing and plugging service with frequent starting and stopping, is the subject of this 4-pp. illustrated leaflet. These motors have intermittent ratings of from 1 to 200 h.p. and are designed for operation at commercial frequencies and voltages. Economical operation, sturdy construction, sealed-sleeve bearings, thorough insulation, and a rigorous radio-frequency test are features stressed.

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COLD WEATHER CARE OF ACETYLENE — **The Linde Air Products Co.,** 205 East 42nd St., New York, N. Y. (40 pp., illustrated.) Contains valuable suggestions for the proper maintenance of acetylene generators and associated equipment subject to freezing. Explains how to prevent freezing of acetylene generators, hydraulic back-pressure valves, distribution piping and hose, regulators, relief valves, and water-cooled blowpipes, together with suggestions for procedures where freezing has occurred. Charts and tables provide a quick reference to antifreeze requirements for hydraulic back-pressure valves.

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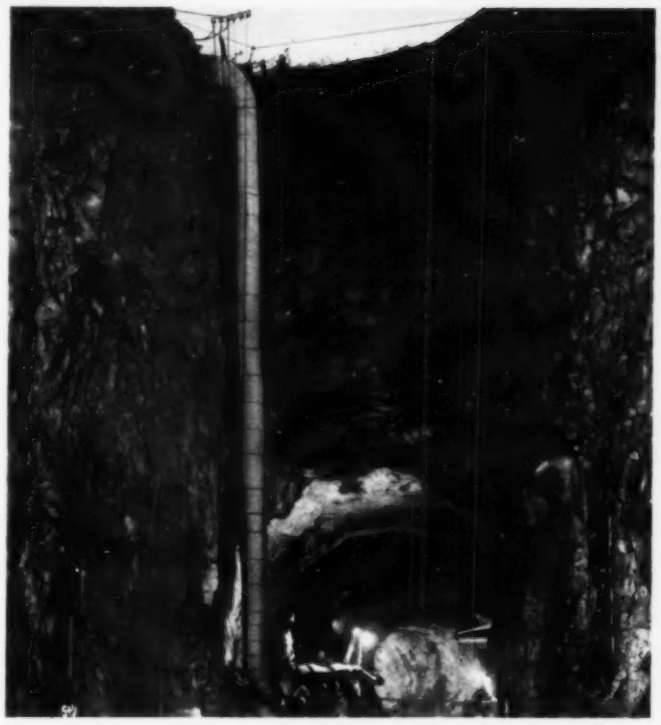

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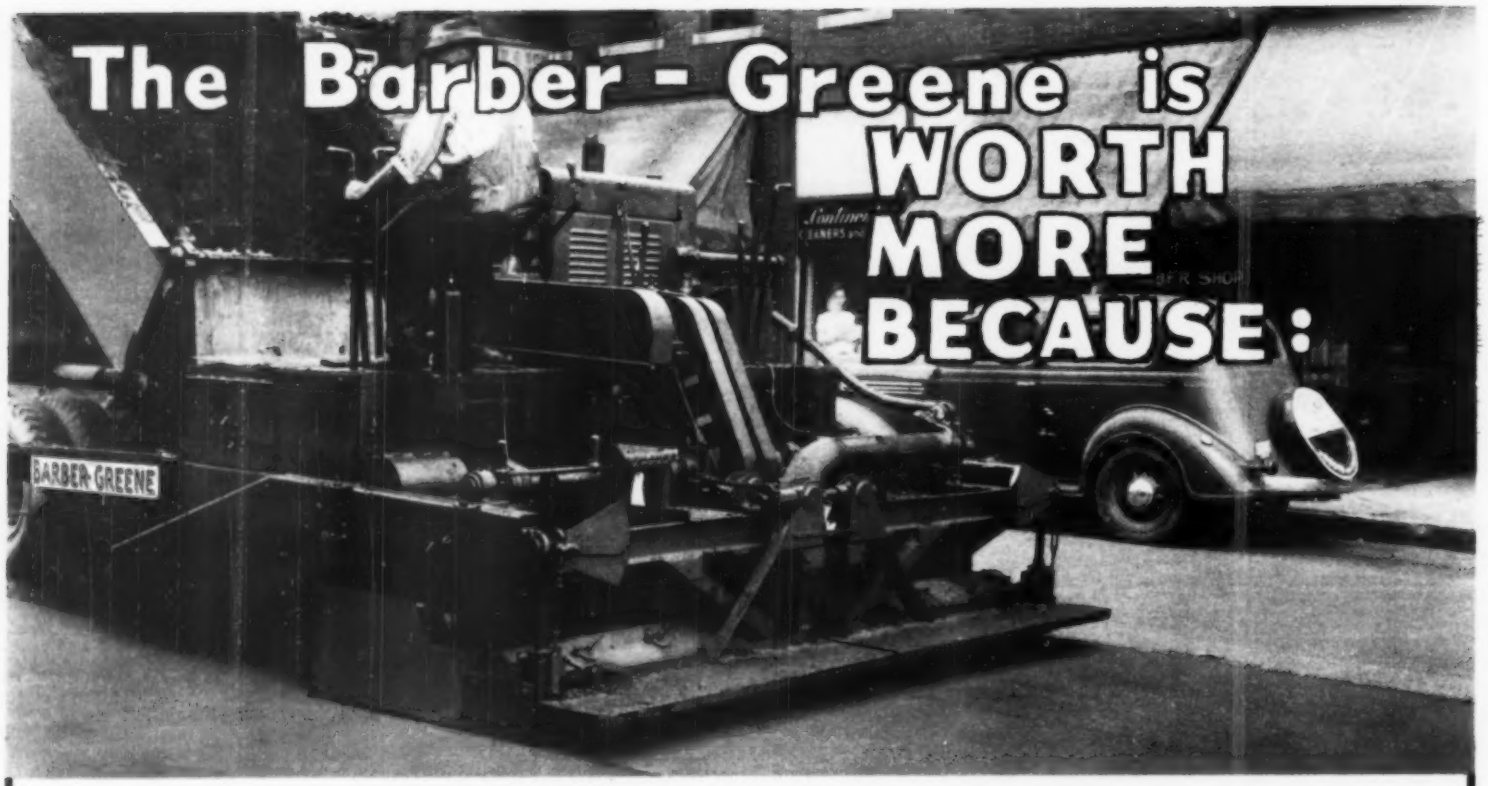

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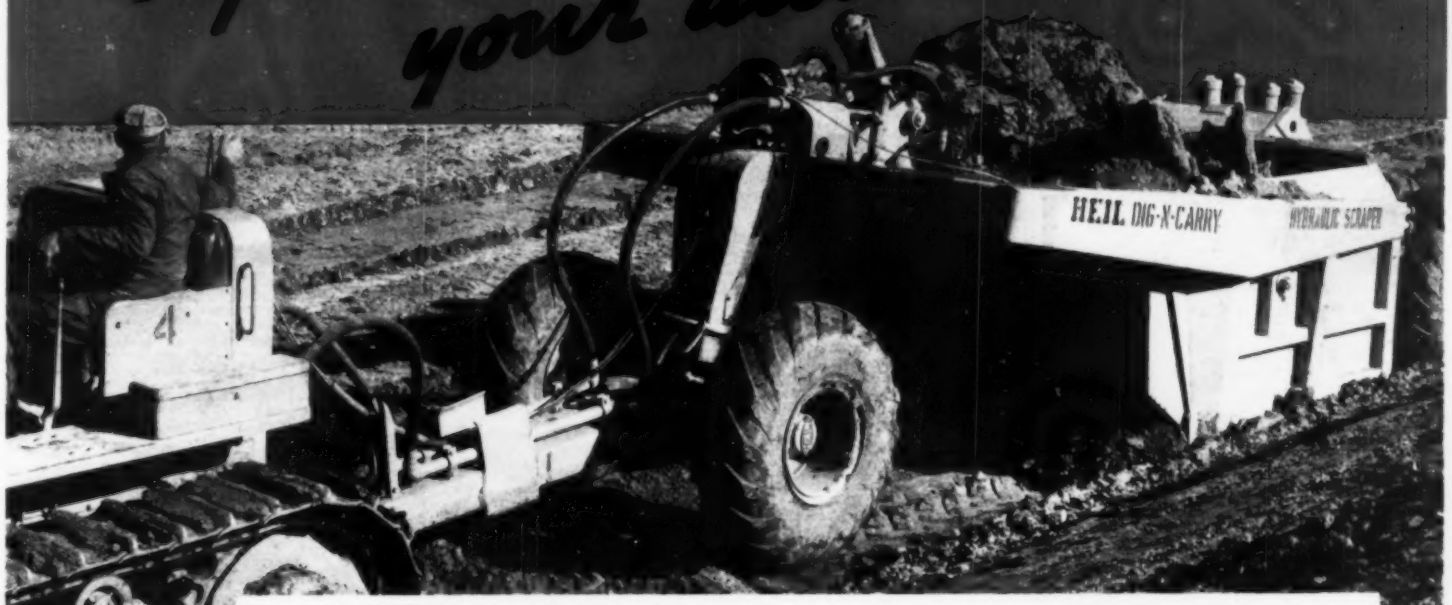

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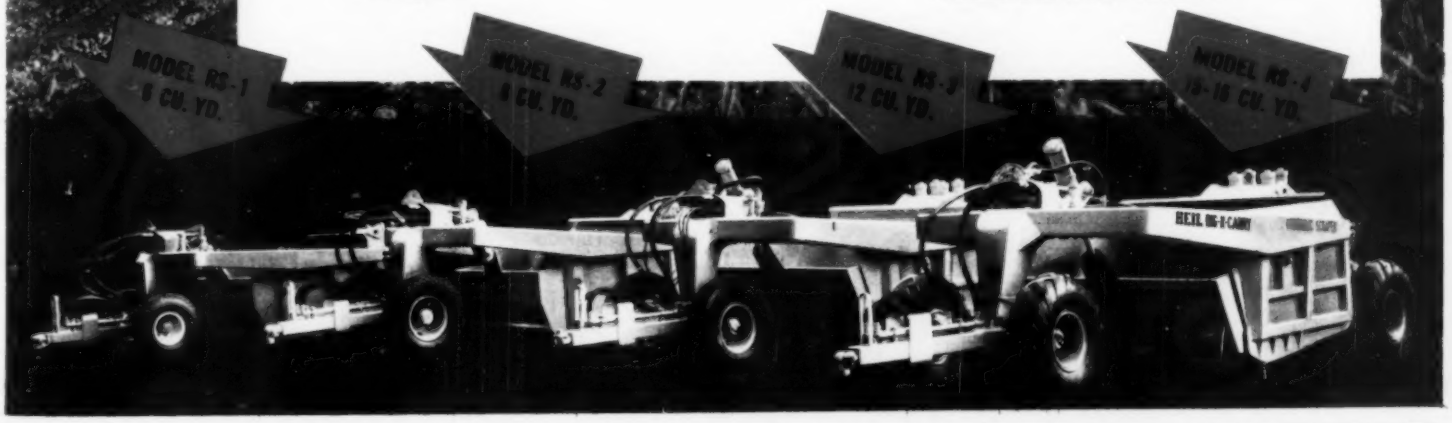

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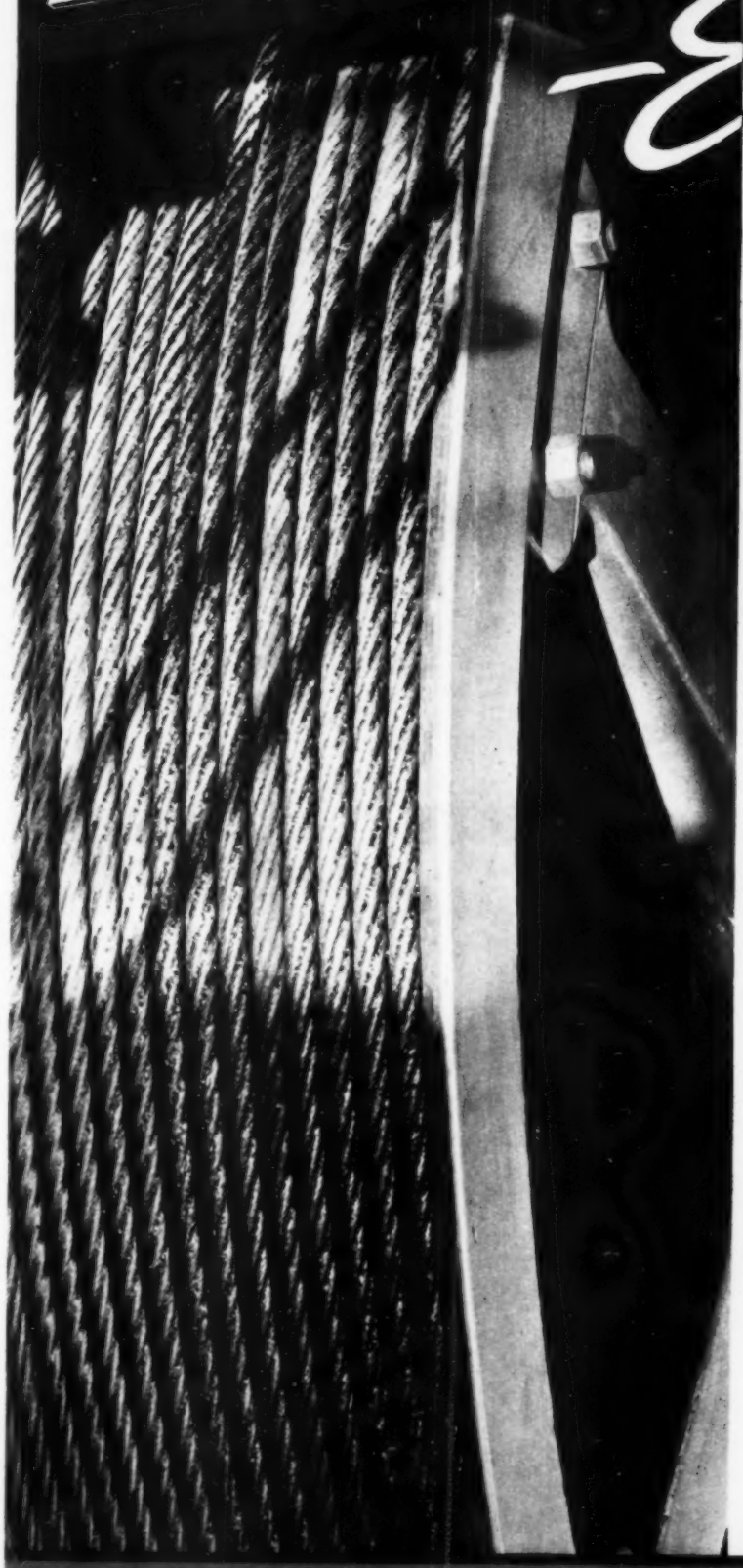

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